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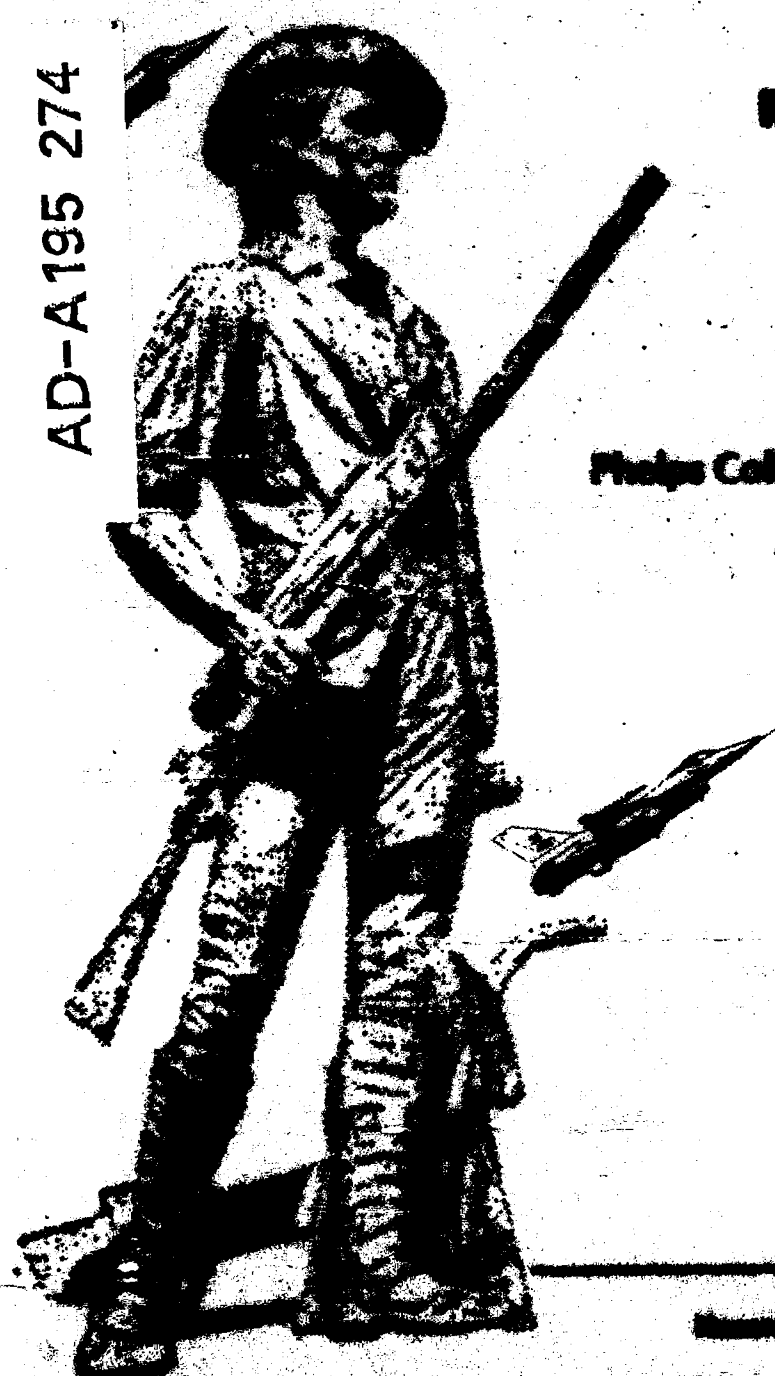
INSTALLATION RESTORATION PROGRAM



Records Search

Phelps Collins Air National Guard Base
Alpena, Michigan

Hazardous Materials Technical Center
July [illegible]

NOTICE

This report has been prepared for the Michigan Air National Guard by the Hazardous Materials Technical Center for the purpose of aiding in the implementation of the Air Force Installation Restoration Program.

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INSTALLATION RESTORATION PROGRAM
RECORDS SEARCH

Prepared for

Phelps Collins Air National Guard Base
Alpena, Michigan

Prepared by

THE HAZARDOUS MATERIALS TECHNICAL CENTER
The Dynanac Building
11140 Rockville Pike
Rockville, Maryland 20852

June 1985

Contract No. DLA 900-82-C-4426

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

A. INTRODUCTION

1. The Hazardous Materials Technical Center (HMTC) was retained on January 1985 to conduct the Phelps Collins Air National Guard Base (ANGB) Records Search under Contract No. DLA 900-82-C-4426, with funds provided by the Michigan ANG.

2. Department of Defense (DOD) policy, directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DOD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.

3. To implement the DOD policy, a four-phase Installation Restoration Program (IRP) has been directed. Phase I, the Records Search, is the identification of potential problems. Phase II (not part of this contract) consists of follow-on field work to determine the extent and magnitude of contaminant migration. Phase III (not part of this contract) consists of developing any required new technology to abate unique contamination problems. Phase IV (not part of this contract) evaluates alternatives for remedial actions and any efforts required to control identified hazardous conditions.

4. The Phelps Collins ANGB Records Search included a detailed review of pertinent installation records, contact with ten outside agencies for documents and information relevant to the Records Search effort, and two onsite base visits conducted by HMTC during February 25-28, and May 6-7, 1985. Activities conducted during the onsite base visits included interviews with 15 past and present base employees, ground

tours, detailed search of base records, and meetings with personnel from several Michigan State agencies in Roscommon, Michigan.

B. MAJOR FINDINGS

1. The major industrial operations of Phelps Collins ANGB which have produced hazardous wastes include Aircraft Maintenance, Ground Vehicle Maintenance, Fuels Management, and Roads and Grounds Maintenance. These operations generate varying quantities of waste oils, recovered fuels, and spent solvents and cleaners.

2. Various mechanisms for disposal of the waste materials generated by these shops have existed in the past. These include disposal via the Defense Property Disposal Office (DPDO), neutralization of the wastes and discharge to the sanitary sewer, burial in the on-base landfills, burning at the various Fire Department Training Areas, and discharge onto the ground. Since 1980, the majority of the hydrocarbon wastes have been disposed of via DPDO.

3. Interviews with 15 previous and present base employees and a field survey resulted in the identification of 15 past disposal and/or spill sites at Phelps Collins ANGB. Of these 15 sites, 7 have been further evaluated using the Air Force's Hazard Assessment Rating Methodology (HARM). Table ES-1 presents a priority listing of these waste disposal and spill sites and their associated hazard assessment scores.

C. CONCLUSIONS

1. Evidence of groundwater contamination was discovered before the Phase I study by sampling done by the U.A. Air Force's Occupational and Environmental Health Laboratory (OEHL) and the Michigan Department of Public Health (MDPH).

Table ES-1
Priority Listing of Waste Disposal and Spill Sites and HARM Scores.

			SUBSCORES				
Priority	Site No.	Site Description	Receptors	Waste Character-istics	Pathway	Waste Mgmt. Practices	Overall Score
1	6	Former Solid Waste Landfill	65	100	68	1.0	78
2	7	First Fire Dept. Training Area	65	100	50	1.0	72
3	4	Third Fire Dept. Training Area	59	100	61	0.95	70
4	5	Second Fire Dept. Training Area	57	100	50	1.0	69
5	2	Motor Pool Area	67	80	68	0.95	68
6	1	POL. Area	65	60	47	0.95	54
7	3	Former Site of County Garage	63	40	47	0.95	48

2. The overall groundwater environment at Phelps Collins ANGB is susceptible to contamination from surface contaminants. The primary factors contributing to this susceptibility are the highly permeable soils characteristic to the area and the shallow aquifer systems.

3. No evidence of off-base environmental stress resulting from past disposal of waste materials was observed in the immediate vicinity of Phelps Collins ANGB. However, the close proximity of the sites to the south branch of Thunder Bay River increases the likelihood of off-base contaminant migration via the groundwater pathway leading to the south branch.

D. RECOMMENDATIONS

The potential for contaminant migration at Phelps Collins ANGB is moderately high; therefore, it is recommended that Phase II monitoring be conducted. This monitoring should consist of analysis of soil and groundwater samples for selected organic and inorganic parameters. The primary purposes for monitoring each of the proposed locations are to:

- Determine the depth within the unsaturated zone to which contaminants have migrated. If only the shallow subsurface has been contaminated at a particular site, it may be possible to remedy the problem by excavating the contaminated material, if concentration levels warrant excavation.

- Determine whether groundwater at each monitoring site has been contaminated.

- Determine the extent of contamination and the rate and direction of contaminant migration, if groundwater contamination is observed.

Six of the seven rated sites are recommended for Phase II monitoring. These sites have been grouped into monitoring areas on the basis of their proximity to each other. Figure ES-1 illustrates the three general areas at Phelps Collins ANGB that are recommended for monitoring, and the locations of the spill/disposal sites within these areas. One of the proposed monitoring areas encompasses more than one spill/disposal site due to the close proximity

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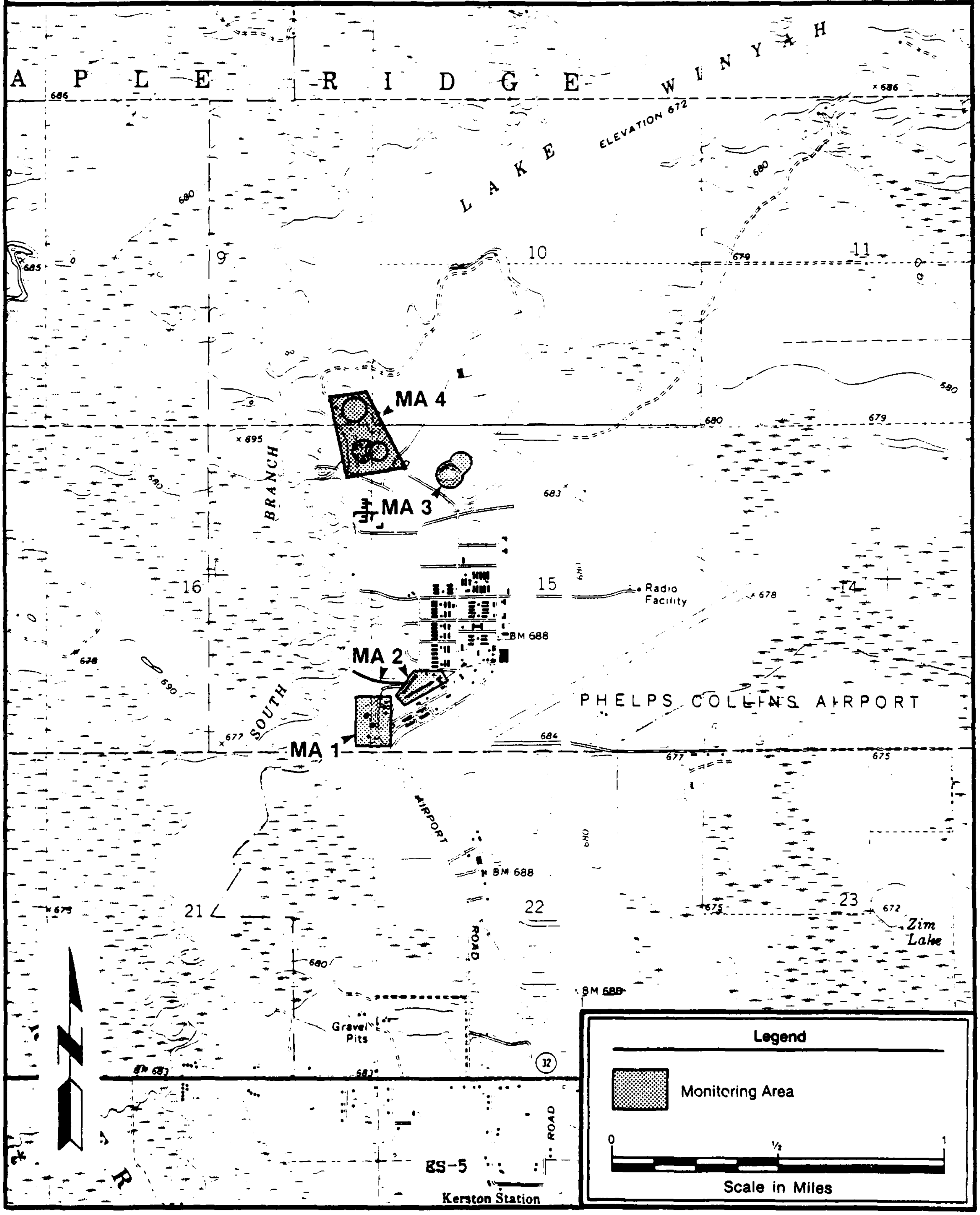
Figure ES-1.
Locations of Proposed Areas of Phelps Collins ANGB to be Investigated During Phase II of the IR Program.



of the sites. The first monitoring area encompasses the POL area (Site No. 1). The second monitoring area encompasses the Motor Pool area (Site No. 2). The third monitoring location covers the third or most recent Fire Department Training area (Site No. 4) and the sink hole. The fourth monitoring area encompasses the landfill site and the first and second Fire Department Training areas (Site Nos. 6, 7, and 5, respectively).

Site No. 3 (former location of county maintenance garage) is not included in any monitoring location because plans are currently underway to convert a significant portion of the old county maintenance garage area into a major new POL storage and distribution facility. As part of this effort, Phelps Collins ANGB is implementing an extensive groundwater monitoring program throughout this area to assess potential contamination caused by past maintenance activities. This program is being conducted independently of the Phase II portion of the IRP; therefore, to avoid repetition, no additional Phase II IRP recommendations are presently made for this site.

Enlargements of the proposed areas to be monitored at Phelps Collins ANGB are illustrated in Figure ES-2.

Monitoring Location No. 1 primarily includes only the existing POL storage and distribution area. Four shallow monitoring wells are recommended at this site as illustrated in Figure ES-2. During the site ground survey walkthrough, no evidence of contamination was observed; however, wells are still being recommended to monitor for any subtle contamination which may have resulted from petroleum product spill which occurred at this site and, possibly, minor contamination associated with small spillages which may have been related to routine product handling. As well as providing chemical groundwater quality information, these wells will also provide physical groundwater data which should be helpful in determining the direction of movement of shallow groundwater at this area.

It is also recommended that shallow subsurface sediment samples (sediment samples SS-1 and SS-2) be collected from the drainage ditch which runs

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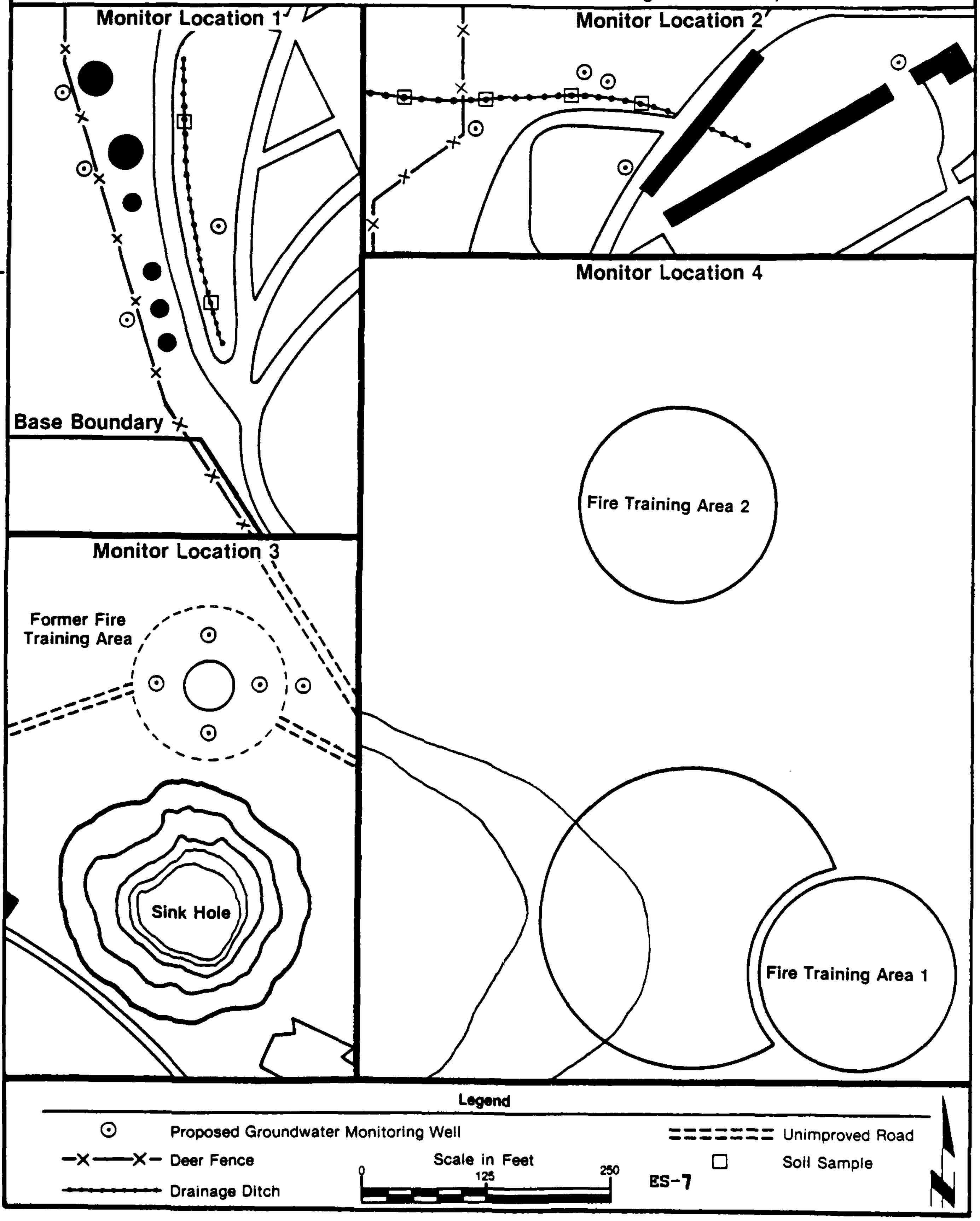
Figure ES-2.
Locations of the Proposed Groundwater Monitoring Wells within the Proposed Areas to be Investigated at Phelps Collins ANGB.



parallel to the POL access road, immediately adjacent to the primary storage tanks. No visual evidence of contamination was observed within this drainage swale; however, it represents a natural collection spot for surface-derived contamination and, for this reason, warrants investigation. Both the sediment samples and the groundwater samples should be screened for priority pollutants and oil and grease.

Monitoring Location No. 2 consists of the current motor pool area (Site No. 2), the fire extinguisher discharge and disposal area, and the storm water drainage ditch which affects surface runoff away from the motor pool area toward the south branch of the Thunder Bay River. Throughout this monitoring location, a total of five monitoring wells and four soil samples are recommended. The soil samples should be collected from the shallow subsurface along the above-mentioned drainage ditch using hand-augering techniques. These sampling locations are indicated in Figure ES-2. Each soil sample should be analyzed for priority pollutants, including tetrachloride and trichloroethylene. This drainage ditch is being monitored because it drains a relatively industrialized area. Interviewees did not indicate that contaminants were placed into this ditch, but inadvertent contamination may have resulted. Additionally, groundwater contamination is confirmed at well No. 3. The relatively close proximity of this ditch to well No. 3 makes the ditch suspect.

The monitoring wells recommended for this location include: MW-5, MW-6, MW-7, MW-8, and MW-9. MW-5 is shallow and will be located immediately adjacent to the current refueler bay at the motor pool (Building No. 7). Several interviewees indicated that old fire extinguishers, possibly containing carbon tetrachloride, may have been disposed of at this location prior to construction of the refueler bay. These are possible sources of the carbon tetrachloride reported in well No. 3. Monitoring wells 6, 7, 8, and 9 are recommended at the location indicated in Figure ES-2. Only well 7 is recommended to be deep (screened into the limestone bedrock). Basically, these wells are all downgradient from the motor pool area and are intended to better define the source(s) of contamination of well No. 3 and the impact (if any) of past

activities associated with the motor pool area. Water samples from these wells should be screened for priority pollutants, at a minimum. Except for the deep well, the screened intervals should be coincident with the first occurrence of groundwater.

Monitoring Location No. 3 includes the No. 3 Fire Department Training Area (Site No. 4) and the sinkhole. At the fire training area, four shallow monitoring wells and one deep monitoring well are recommended (Figure ES-2). From each monitoring well, two soil samples should be collected and both the soil samples and water samples should be analyzed for priority pollutants, oil and grease, phenols, and metals. Additionally, the sinkhole should be sampled for similar parameters and the water elevation in the sink hole should be surveyed and compared to the water elevation in the deep monitoring well at this site.

Monitoring Location No. 4 includes the old landfill (Site No. 6) and Fire Training Area Nos. 1 and 2 (Site Nos. 7 and 5, respectively). Relatively large amounts of hazardous materials are known to have been disposed at the old landfill. The exact boundaries of the landfill are unclear, and a plat of the landfill showing the location of its contents is lacking. Additionally, the fire training areas were uncontained and lacked definite boundaries. For these reasons, 28 monitoring wells are recommended for this site. The locations for the monitoring wells are not illustrated in Figure ES-2, since the boundaries of the monitoring locations are poorly defined. Before well construction takes place, a site survey will need to be done. The general locations for all wells are described below:

- Five shallow monitoring wells (screened coincident with the first occurrence of groundwater) are recommended along the downgradient (toward the bog) perimeter of the landfill.

- Five deep monitoring wells (screened into the limestone bedrock which underlies the unconsolidated overburden). These deep wells should not penetrate any of the original landfill material because, despite proper construction techniques, such wells could induce downward contaminant migration. Instead, these wells should be evenly spaced around the landward perimeter of the landfill. Unfortunately, such offsite positioning slightly decreases the capability of these wells to detect a deep contaminant plume. However, it greatly decreases the risk that highly concentrated shallow subsurface groundwater

contamination will be granted direct access to the deeper aquifer along improperly grouted well bores.

- Ten shallow monitoring wells are recommended throughout the area of the actual landfill. The exact locations should be determined on the basis of the geophysical studies currently being conducted at this site. For example, well locations should be approximately coincident with potential "hot spots" identified by the geophysical survey.

- Two soil samples are recommended from each of the ten shallow monitoring wells installed on the basis of the hot spots identified by the geophysical investigation.

At each of the fire training pits within this monitoring location, four monitoring wells are recommended, giving a total of eight monitoring wells associated with the fire training pits. At each training area, three wells should be located downgradient and one should be located upgradient. Also, two soil samples should be collected from each monitoring well. The first soil sample should be from the very shallow subsurface and the second from a greater depth. Water and soil samples should be analyzed for priority pollutants, oils and grease, metals, and phenols.

All monitoring wells should be designed and constructed so that they facilitate:

- Determination of vertical variations in parameters such as aquifer permeability, pressure head, and contaminant concentrations. Whether such data are acquired using, for example, nested piezometers or fully screened wells fitted with packers is at the discretion of the IRP Phase II Contractor. Such information is important for determining the three-dimensional orientation and movement of the contaminant plume and for designing any required Phase IV Remedial Actions.

- At a minimum, the well construction protocol should include:

  - Tremie grouting of the annular space for each well to a depth of 5 feet below ground surface.

  - Recording of detailed well logs which include daily static water levels, type of geologic materials encountered, depths to water-producing zones, and samples of cuttings from each well that are collected from 5-foot intervals.

  - Proper identification and surveying of all wells.

Groundwater from each screened interval for all wells, and samples taken from the sinkhole, should be collected and analyzed for volatile organic carbon species, oil and grease, and total organic halogens. All groundwater quality data should be statistically analyzed by methods approved by the U.S. Environmental Protection Agency and Michigan Department of Water Resources in order to identify significant differences in groundwater quality.

1. INTRODUCTION

I. INTRODUCTION

A. Background

Phelps Collins Air National Guard Base (Phelps Collins ANGB) is located at Phelps Collins Airport, a county-owned facility approximately 7 miles west of the City of Alpena on Highway M-32. In January 1952 the Air National Guard (ANG) negotiated joint use of the base and has since maintained a portion of it as a Field Training Site (FTS). Air National Guardsmen conduct training exercises at the base throughout the year. Most of the training is held during the summer months from april through September, during which time various units undergo two weeks summer training. In addition, various flight units from the Army and Navy routinely use the base for training missions. Over the years other groups have based activities there, including the Army Air Corps (from the late 1930s to 1947) and the Alpena County Road Commission, and a full time air defense unit (from 1964 to 1972). Both past and present operations have involved the use and disposal of some hazardous materials.

In 1975 DOD began its Installation Restoration Program (IRP) to assess methods of storage and disposal of toxic and hazardous materials. DOD policy is to identify and fully evaluate suspected problems associated with sites of former hazardous materials disposal, and to control hazards to health and welfare that may have resulted from these past activities.

In 1976 Congress created the Resource Conservation and Recovery Act (RCRA) as the primary means of governing disposal of hazardous wastes. Under Sections 3012 and 6003 of this Act, Federal agencies such as DOD are directed to assist the U.S. Environmental Protection Agency (EPA) and state agencies to inventory past disposal sites and to make the information available to the requesting agencies. Similarly, Congress created the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 to assess and alleviate potential adverse public health and environmental impacts resulting from past hazardous waste management practices. On August 14, 1981,

in Executive Order 12316, the President delegated certain authority specified in CERCLA to the Secretary of Defense. The current DOD IRP policy is contained in DEQPPM 81-5, dated 11 December 1981. It reissued and amplified all previous directives and memoranda regarding the IRP. The IRP is the basis for response action on Air Force installations under provisions of CERCLA, clarified by EO 12316. CERCLA is the primary legislation governing remedial action of past hazardous waste disposal sites.

To conduct the IRP Phase I - Hazardous Materials Disposal/Spill Sites Records Search for Phelps Collins ANGB, HMTC was retained on January 1985 under Contract No. DLA 900-82-C-4426, with funds' provided by the Michigan ANG.

The Records Search is intended to review installation records to identify possible hazardous waste contaminated sites and to assess the potential for contaminant migration from the installation. Phase II (not part of this contract) consists of follow-on field work recommended in Phase I, including a preliminary survey to confirm or rule out the presence and/or migration of contaminants and, if necessary, additional field work to determine the extent and magnitude of the migration. Phase III (also not part of this contract) consists of development of any required new technology to address unique contamination problems. Phase IV (also not part of this contract) includes efforts to evaluate alternatives for remedial actions, and any efforts required to control identified hazardous conditions.

B. Authority

The identification of hazardous material disposal sites at Air Force installations was directed by DEQPPM 81-5, dated 11 December 1981, and implemented by an Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with environmental regulations. The identification of hazardous material disposal sites at selected ANG bases/installations was directed by the Civil Engineering Division in a letter from the Air Directorate NGB/DE dated 18 March 1981.

C. Purpose

The Phase I Records Search identifies and evaluates suspected problems associated with past hazardous materials handling procedures, disposal sites, and spill sites on DOD facilities.

The existence and potential for migration of hazardous material contaminants was evaluated at Phelps Collins ANGB by reviewing environmental information, analyzing installation records, and conducting interviews with past and present employees. Pertinent information includes the history of operations, with special emphasis on hazardous materials management procedures; the geological and hydrogeological conditions that may facilitate migration of the potential contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

D. Scope

The scope of this Records Search is limited to the ANG exclusive-use area of Phelps Collins ANGB (see Figure 1). Actions taken include:

- o two onsite base visits;
- o meeting with personnel from the Department of Natural Resources (DNR) of the State of Michigan;
- o meeting with personnel from a local museum;
- o review and analysis of all information obtained; and
- o preparation of recommendations for further action.

The first onsite visit and the meeting with Michigan's DNR personnel took place from February 25 to 28, 1985. Interviewed personnel at DNR are listed in Appendix A. The HMTC Records Search Team is listed below. (Appendix B contains their resumes):

1. Mr. Donato Telesca, Project Manager/Chemical Engineer (B.S., Chemical Engineering, 1948).

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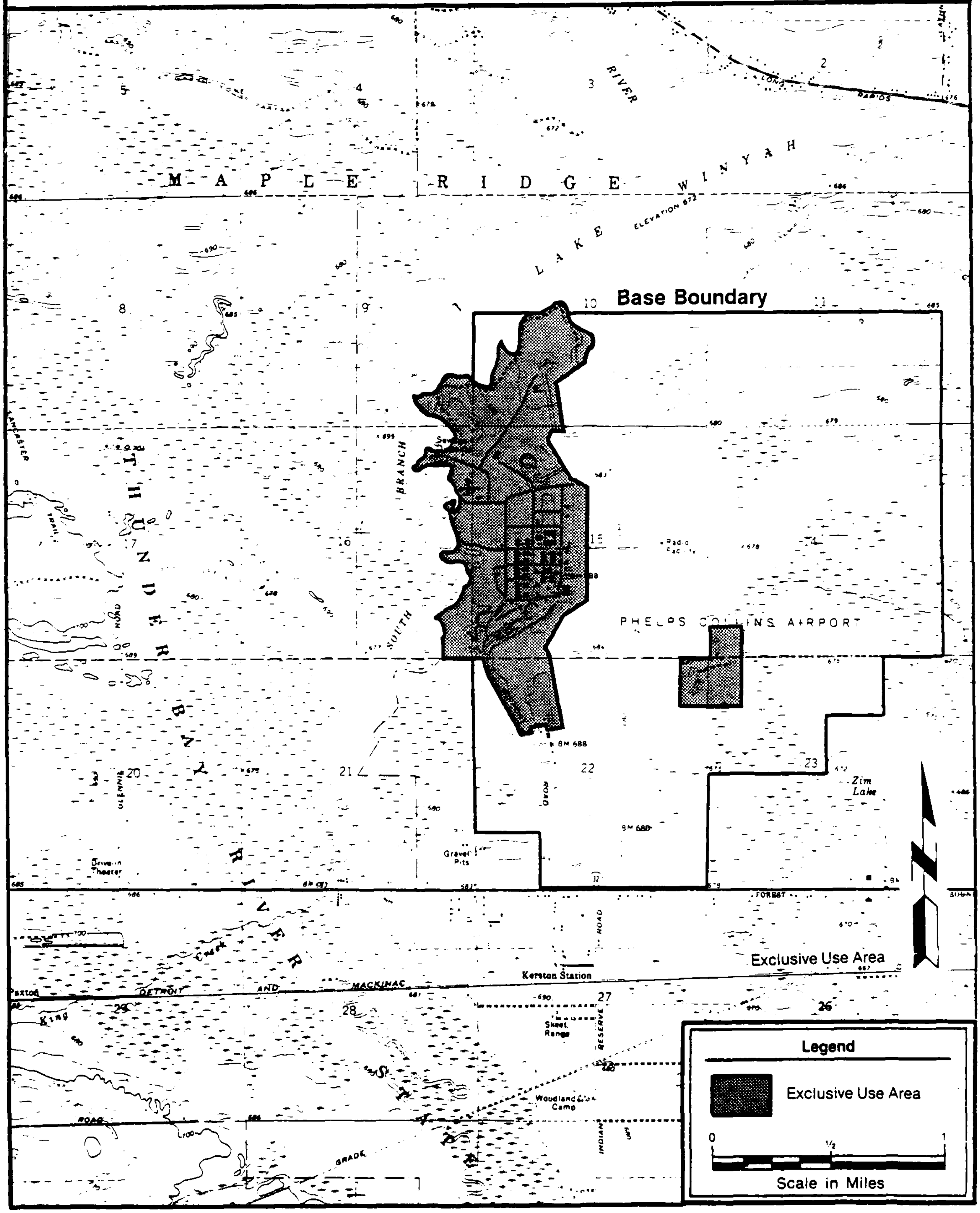
Figure 1.
ANG Exclusive Use Area of Phelps Collins ANGB.



2. Mr. Torsten Rothman, P.E., Environmental Engineer (M.S., Environmental Health Engineering, 1969).

3. Mr. William Eaton, Hydrogeologist (M.S., Environmental Sciences, 1983).

4. Mr. Timothy Gardner, Ecologist (M.A., Environmental Biology, 1983).

Individuals from the ANG who assisted in the Records Search included Mr. Lee Householder, ANGSC/DEV, ANG Program Manager for the IRP, Phase I, and Lt. Col. George Weinhagen, Phelps Collins ANGB, Base Civil Engineer.

A second onsite visit by Eaton and Gardner took place on May 6-7, 1985. The grounds were inspected for environmental stress and other visual evidence of hazardous materials entering the environment.

E. Methodology

Figure 2 is a flow chart of the Records Search methodology. The evaluation began by identifying all locations at Phelps Collins ANGB where hazardous materials were used or disposed of within the bounds of the ANG exclusive-use area. Fifteen such sites were identified. Then, an evaluation of past and present operating procedures at the identified locations was made to determine whether environmental contamination may have occurred.

This process was facilitated by extensive interviews with 15 past and present base employees familiar with the various operating areas of the base. Appendix C lists their principal areas of knowledge and their years of experience at the installation.

Historic blueprints of the base, and records contained in shop files and real property files, were reviewed to supplement information obtained from the interviews. In addition, a general tour of identified sites gathered specific information to help determine the potential for contamination and contaminant

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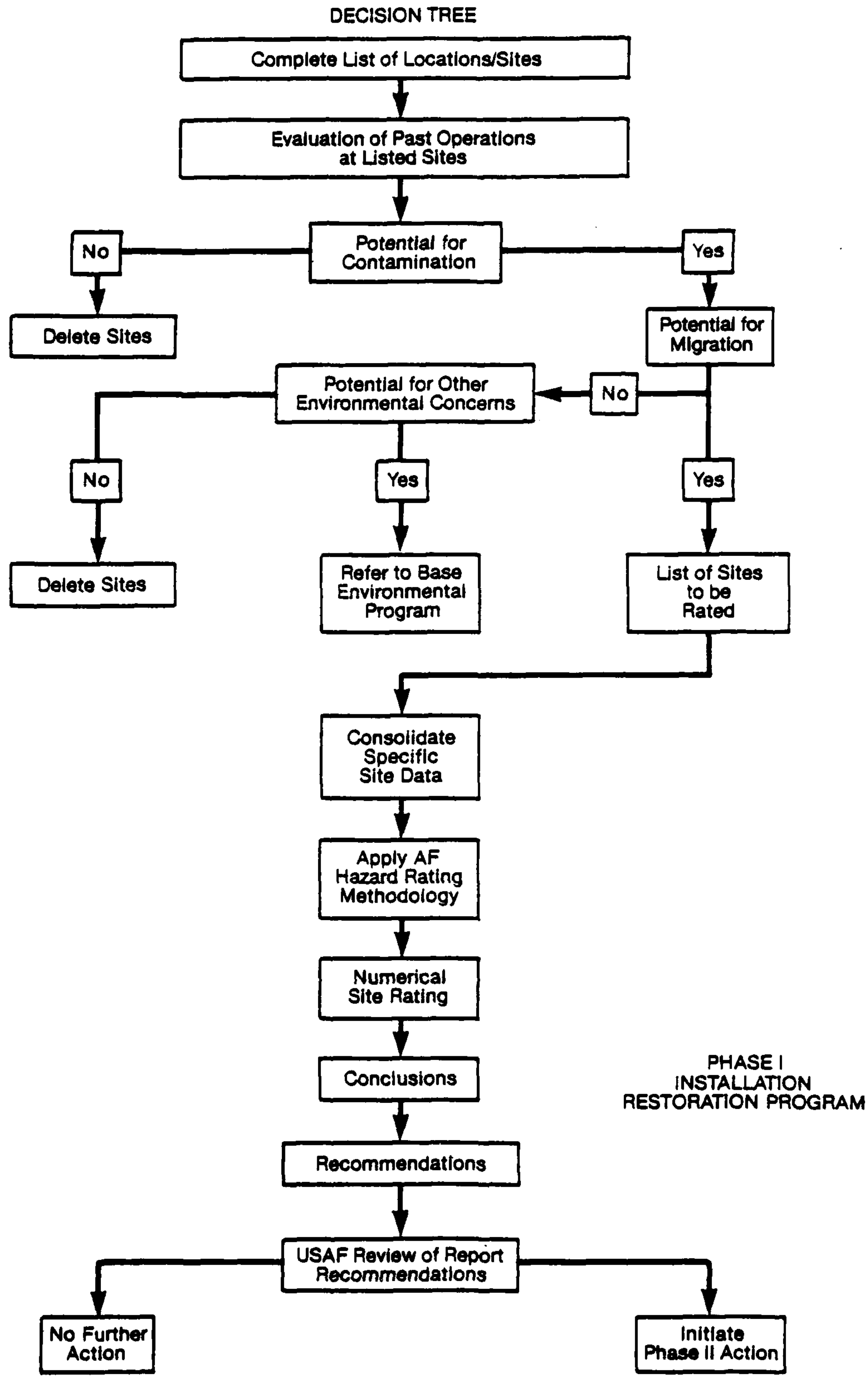
Figure 2.
Records Search Methodology Flow Chart.



migration, e.g., the presence of nearby drainage ditches or surface water bodies, and any visible evidence of contamination or leachate migration.

If an activity was identified that may have contaminated the environment, its location was evaluated for migration potential. Eight of the original 15 sites were eliminated from further consideration because they have little or no potential for contamination, contaminant migration, or adverse environmental impacts. The remaining seven sites were assessed in detail, using the USAF Hazard Assessment Rating Methodology as described in Appendix D. The rating indicates the relative potential for environmental impact at each site. Recommendations were made to confirm and quantify the contaminant migration problem, under Phase II of the IRP, at those sites with significant potential for impact.

2. INSTALLATION DESCRIPTION

II. INSTALLATION DESCRIPTION

A. Location

Phelps Collins ANGB is located at Phelps Collins Airport, a county-owned facility approximately 7 miles west of the City of Alpena, on Highway M-32. Alpena, a community of about 20,000, is primarily an industrial town producing cement, limestone, paper, and machinery. The rest of Alpena County is devoted to farming, forestry, and tourism, and numbers about 15,000.

The base consists of approximately 675 acres designated for exclusive use by ANG, an additional 1,755 acres (including the runways) in joint use with Phelps Collins Airport, and about 270 acres reserved for exclusive use by Alpena County. The entire base covers approximately 2,700 acres. It is located 689 feet above sea level, 45° 05' N latitude and 63° 33' W longitude.

A regional locator map is presented as Figure 3, and vicinity and site maps are provided as Figures 4 and 5, respectively. Figure 5 also shows the area studied for this Phase I report.

B. Organization and History

The site was first used just after World War I for a summer flight training facility. At that time, "Jennies" (Sopwith Camels) could be seen landing and taking off from the grass runway.

The tract was surveyed by the Army Corps of Engineers in 1928, and Harry Fletcher, along with his brother Phillip, donated the first 80 acres of what was to become Capt. Phelps Collins Field. It was located approximately in the center of the present-day runways. Several more 40-acre plots, most of them owned by Alpena Power Company, were added to the airport; Works Progress Administration crews were pressed into service to clear away underbrush and smooth out the landing area.

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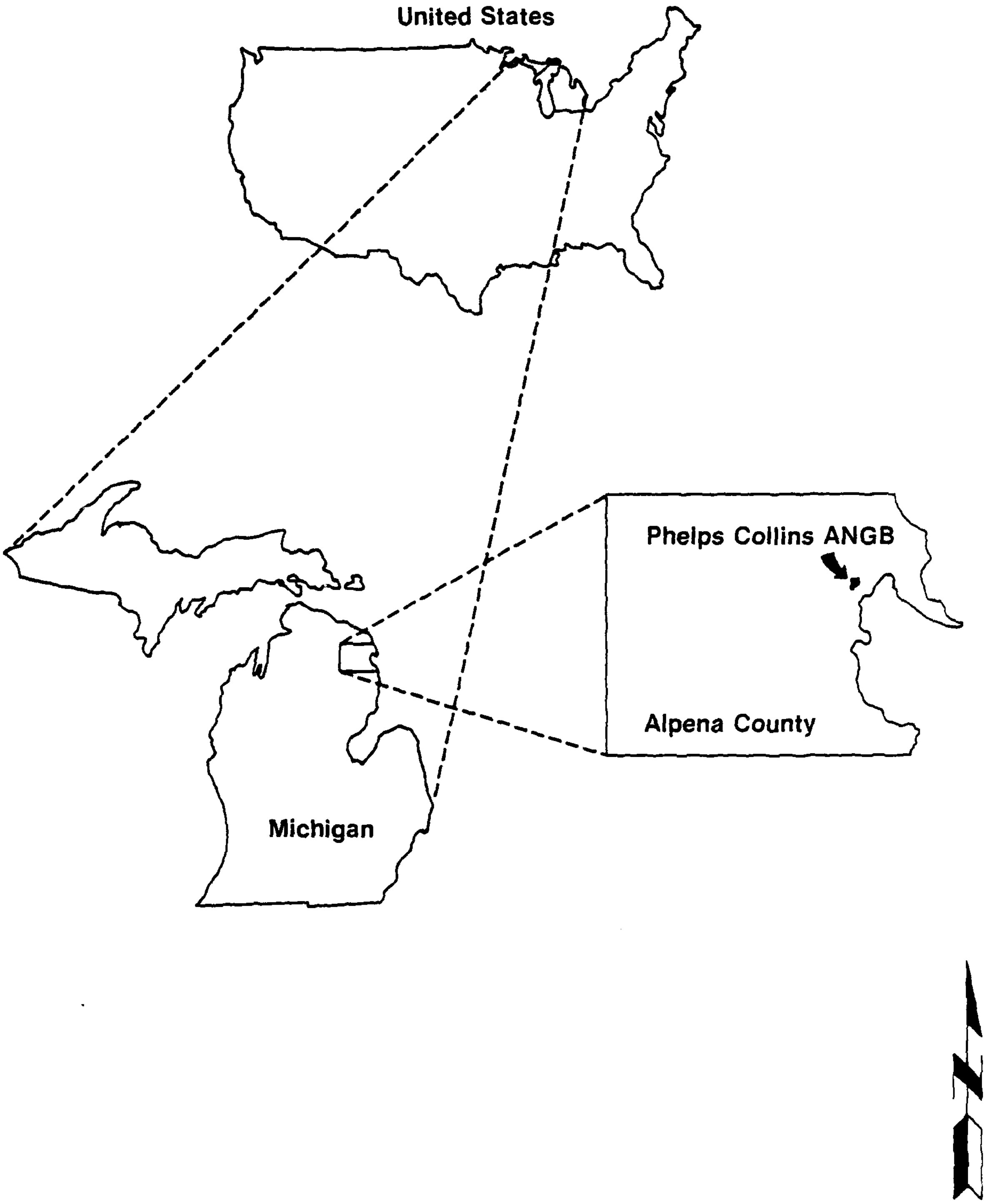
Figure 3.
Location of Phelps Collins ANGB within Alpena County, Michigan.



Not to Scale

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Figure 4.
Vicinity Map of Phelps Collins ANGB.

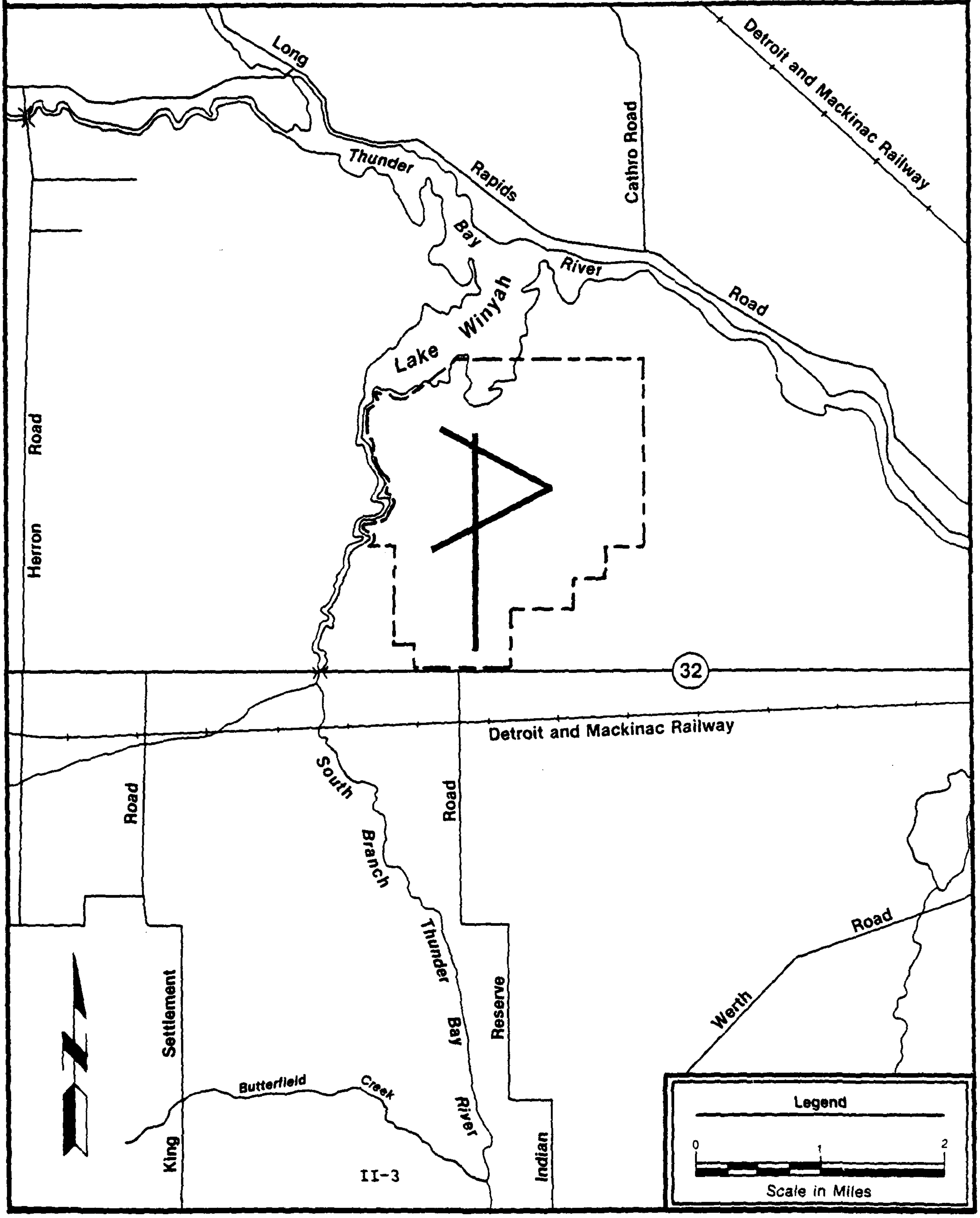

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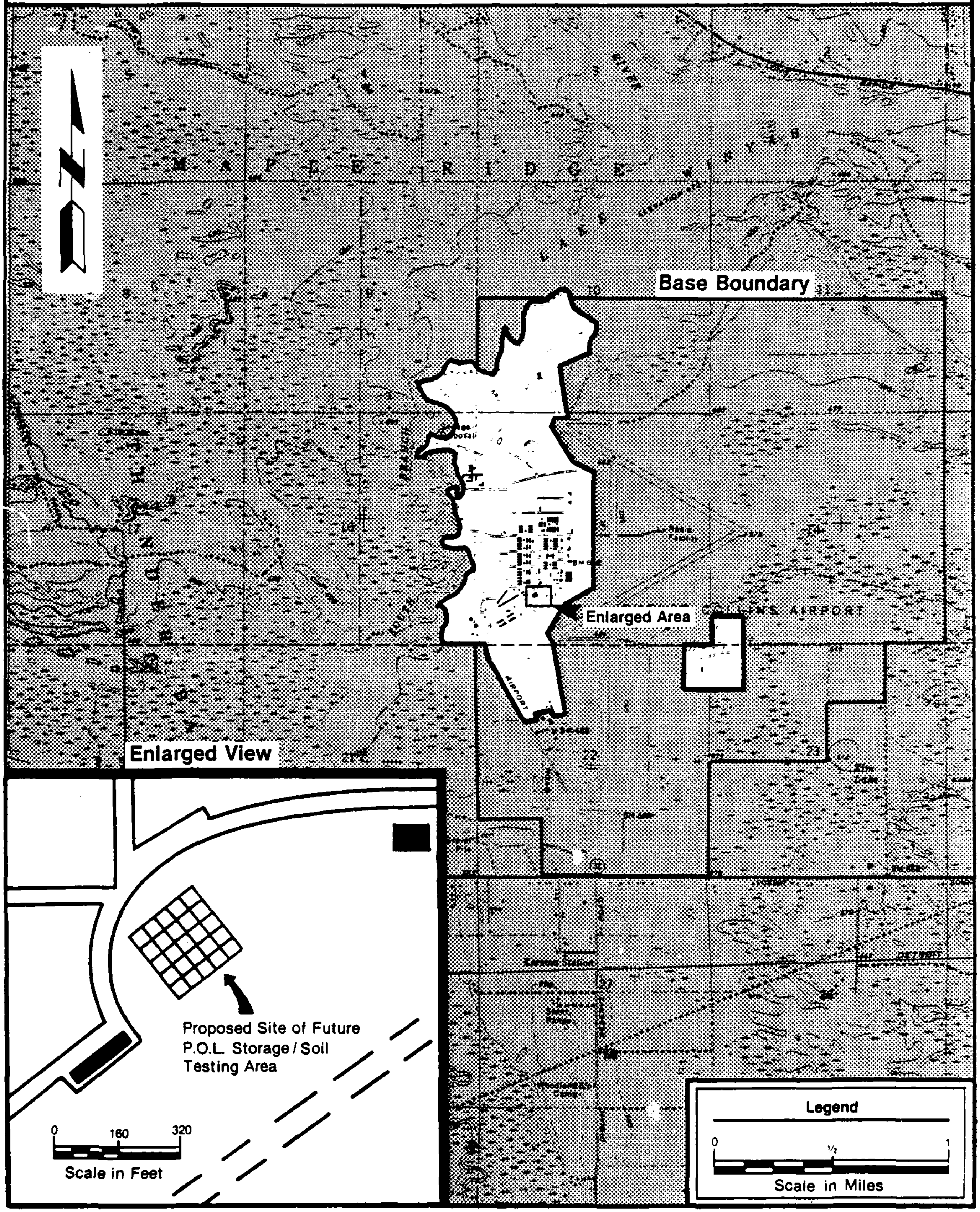
Figure 5.
Site Map of Phelps Collins ANGB.



On August 28, 1931, the airport was formally dedicated as Capt. Phelps Collins Field, in honor of an Alpena World War I hero who fought and died with the Lafayette Escadrille. Governor William M. Brucker flew in with a delegation from Lansing to formally accept the airport - Michigan's first state-owned airport.

The Army Air Corps' First Pursuit Group found the Alpena base ideal for flying training and gunnery exercises. In the late 1930s and early 1940s, the group billeted its ground crews in tents at the Alpena Fair Grounds and flew training missions at Collins Field. The fliers too lived in tents.

In 1940 the fighter unit brought some 400-500 men to Alpena along with 35 Seversky P-35 single-engine fighters for gunnery training. With war impending, the tempo of training picked up. In 1941 they brought in P-40 Warhawks and some of the first P-38 Lockheed Lightning fighters built for the Army Air Corps.

With the Army Air Corps expanding rapidly following Pearl Harbor, the demand for new training facilities was critical and the War Assets Administration took over Collins Field and launched a huge $5 million expansion project. Housing units for 2,600 men, mess halls, operations buildings, a hospital, and three runways over a mile long and 150 feet wide were built in 1942. The old cobblestone hangar was razed to make way for new construction. By this time, the base had expanded to 2,700 acres.

In 1947 the War Assets Administration turned the complete installation over to Alpena County and it reverted to use as a civilian airport.

Air National Guard officials had indicated an interest in acquiring joint use of the field as early as 1948, but it was not until January 1952 that negotiations were completed. Ever since then, the base has been maintained as a field training area. Thousands of Air National Guardsmen from a dozen states have encamped at Collins Field for summer training annually, and their presence meant continued improvement of base facilities. Training takes place

year-round, with the greatest influx of Guardsmen occurring during the months of April through September, at which time they undergo two week periods of summer training. By 1956, the Guard had invested almost $2.5 million into Collins Field, extending the north-south runway to 8,000 feet, and constructing 62 concrete block buildings including a dining hall designed to accommodate 2,000 men. In addition, an Aircraft Warning and Surveillance system was installed and used from 1952-58. Airport and base maintenance were supplied by the County Road Commission, which occupied several buildings in the field.

In 1963 a new $118,000 control tower was built. Later, the main north-south runway was extended to 9,000 feet, plus 1,000-foot overruns at each end, and improvements to buildings, auxiliary runways, and taxi strips were completed. In 1964, a detachment of aircraft and personnel were on 24-hour alert, and they remained operational until 1972. Alert hangars and facilities were constructed at that time.

Even though Collins Field was developed and has thrived mainly as a military training site, civilian aviation also has expanded as an integral part of base activities. Today, Simmon's Airlines has four scheduled flights daily, and a number of private aircraft operate out of the airport. Since the mid-1950s Phelps Collins ANGB has had no assigned aircraft except for the Air Defense Operation from 1964 to 1972.

C. Physical Description

The Phelps Collins ANGB airfield pavement complex consists of N-S Runway, 9000 ft (2745m) x 150 ft (46m); Northeast-Southwest (NE-SW) Runway, 5030 ft (1534m) x 150 ft (46m); Northwest-Southeast (NW-SE) Runway, 5030 feet (1534m) x 150 ft (46m); Operation Apron, 116,700 yd^2 ($97704m^2$; six taxiways, A, B, C, E, F, and G, 75 ft (23m) wide ranging from 700 ft (314m) to 4000 ft (1220m) in length; two warm-up aprons, one each on Taxiways A and G; Taxiway D, 1150 ft (351m) x 50 ft (15m); Taxiway, 1450 ft (443m) x 75 ft (23m); and Aircraft Maintenance Aprons.

The base is fully equipped to satisfy the requirements of a field training site. Facilities include billeting for approximately 2,000 persons; two dining halls; a base exchange; a hospital; a dispensary; a chapel; and various recreational facilities, in addition to the equipment maintenance and training facilities.

3. ENVIRONMENTAL SETTING

III. ENVIRONMENTAL SETTING

A. Meteorology

The following climatological summary, including the data in Table 1, is from the official records of the National Oceanic and Atmospheric Administration for Alpena, Michigan, and applies to conditions at Phelps Collins ANGB.

The climate along the immediate Lake Huron shore is semi-maritime and lacks most of the temperature extremes shown in many cases only a few miles inland. Outbreaks of unusually warm air are infrequent during the winter months, resulting in a winter of comparatively uniform day-to-day temperatures. Subzero temperatures have been recorded as early as November 22, and as late as April 2, but are most frequent during February. Large areas of open water in Lakes Superior, Michigan, and Huron during the early winter months help keep early winter minimum temperatures higher than are common to this latitude. However, as ice begins to cover large areas of these lakes, especially near the Straits, the more stable cold air masses will produce readings well below zero. Thunder Bay and the river are usually free of ice by the first week in April, but water temperatures remain low enough to produce diurnal sea breezes during the middle of the day, with subsequent reduction in maximum temperatures on many days during the spring and summer. Summer temperatures as high as 104°F have been recorded here, but are unusual; the average number of days with temperatures 90°F or over, in 45 years of record at the Federal Building location, was slightly over three per year. The average date of the last killing frost is May 12, but frost has occurred as late as June 9. The average date of the first killing frost in autumn is October 4, but it has occurred as early as September 6.

Precipitation is fairly well distributed throughout the year and averages 28.78 inches. Using the method for calculating net precipitation outlined in the Federal Register (Vol. 47, No. 137, Friday, July 16, 1982, paragraph 3.2), a net precipitation value of 2.78 inches per year is obtained. Nearly all of

Table 1.
Summary of Meteorological Data for Phelps Collins ANGB.

Month	Temperature °F Normal: Daily maximum	Daily minimum	Monthly	Precipitation in inches, Water equivalent: Normal	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs.	Year	Snow, Ice pellets: Maximum monthly	Year	Maximum in 24 hrs.	Year
(a)					25		25		25		25		25	
J	26.2	8.5	17.4	1.65	3.31	1978	0.16	1961	1.83	1978	43.5	1978	16.3	1978
F	28.1	7.8	18.0	1.34	3.17	1971	0.12	1982	1.24	1977	33.4	1967	13.7	1981
M	36.9	16.7	26.8	1.93	4.44	1976	0.64	1974	1.33	1971	35.8	1971	15.0	1971
A	51.1	29.4	40.3	2.50	4.15	1980	1.18	1978	1.20	1965	12.3	1980	8.0	1973
M	64.4	38.6	51.5	2.83	8.29	1983	1.05	1966	2.50	1973	3.7	1974	3.7	1974
J	74.2	48.1	61.2	3.16	8.37	1969	1.12	1964	2.65	1969	0.0		0.0	
J	79.0	53.0	66.0	3.11	7.17	1975	0.91	1966	3.15	1974	0.0		0.0	
A	76.8	52.1	64.5	3.17	5.76	1975	0.92	1970	3.18	1968	0.0		0.0	
S	68.1	45.0	56.6	2.92	6.67	1968	0.28	1979	3.02	1968	T	1974	T	1974
O	57.5	36.6	47.1	1.99	4.78	1969	0.61	1971	1.57	1969	4.3	1969	3.8	1969
N	42.8	27.3	35.1	2.21	7.45	1966	0.78	1962	1.93	1966	30.5	1966	16.1	1966
D	30.9	16.0	23.5	1.95	4.44	1971	0.61	1976	1.63	1971	46.3	1970	12.4	1970
YR	53.0	31.6	42.3	28.78	8.37	JUN 1969	0.12	FEB 1982	3.18	AUG 1968	46.3	DEC 1970	16.3	JAN 1978

Month	Relative humidity pct.: Hour 01	Hour 07	Hour 13	Hour 19 (Local Time)	Wind: Mean speed m.p.h.	thru 1963 Prevailing direction	Fastest mile: Speed m.p.h.	Direction	Year	Mean Number of days: Precipitation .01 inch or more	Snow ice pellets 1.0 inch or more	Thunderstorms	Heavy fog visibility ¼ mile or less	Temperature °F Max. 90° and above	Max. 32° and below	Min. 32° and below	Min. 0° and below
(a)	18	24	24	24	23	4	21	21		24	24	23	23	24	24	24	24
J	78	79	69	74	8.6	SW	38	N	1978	14	7	*	1	0	23	31	9
F	76	77	65	70	8.1	W	33	NW	1968	11	5	0	1	0	19	28	9
M	77	81	62	67	8.8	SW	42	SE	1965	13	4	1	3	0	10	28	3
A	76	79	54	60	9.1	NW	43	W	1963	12	1	2	2	0	1	20	*
M	78	77	51	56	8.2	SE	36	W	1964	12	*	4	3	*	0	8	0
J	85	81	53	60	7.3	SW	40	W	1969	11	0	6	3	2	0	1	0
J	85	83	53	60	6.9	W	32	NE	1976	10	0	7	2	3	0	0	0
A	88	89	58	68	6.5	SE	33	NW	1967	11	0	6	3	1	0	*	0
S	87	90	61	76	6.9	SW	32	NW	1974	12	0	4	3	*	0	2	0
O	83	86	61	76	7.6	SW	35	NW	1976	12	*	1	3	0	*	11	0
N	82	84	69	78	8.2	W	44	W	1970	13	2	*	3	0	4	22	*
D	82	82	74	79	8.3	SW	33	W	1971	16	6	*	1	0	18	29	3
YR	81	82	61	69	7.9	SW	44	W	NOV 1970	145	26	32	28	6	74	180	25

(a) Length of record, years, through the current year unless otherwise noted, based on January data.

* Less than one-half.

T Trace

BLANK entries denote missing or unreported data

NORMALS - Based on record for the 1951-1980 period.

MEANS - Length of record in (a) is for complete data years.

WIND DIRECTION - Numerals indicate tens of degrees clockwises from true north. 00 indicates calm.

FASTEST MILE WIND Speed is fastest observed 1-minute value when direction is in tens of degrees

the winter precipitation is snow, which usually accumulates sufficiently to form a good cover for grasses and winter grains; the spring thaw and runoff seldom offer any flood danger. Most of the summer precipitation is the result of showers or thundershowers, most often during the months of June, July, and August. Hailstorms average less than one per summer.

Prevailing winds are from the northwest except during May and June, when southeasterly winds predominate. During July and August, when Lake Huron surface temperatures are near their maximum, southeasterly winds occur during the warmest hours of the day when conditions are favorable for sea breezes.

The proximity of large bodies of water naturally brings relative humidity averages above those of neighboring inland locations.

The winter months are usually rather cloudy and marked by frequent snow flurries, but summer months are rather pleasant with considerable sunshine and an average of more than 15 hours of daylight for outdoor activities (National Oceanic and Atmospheric Administration, 1983).

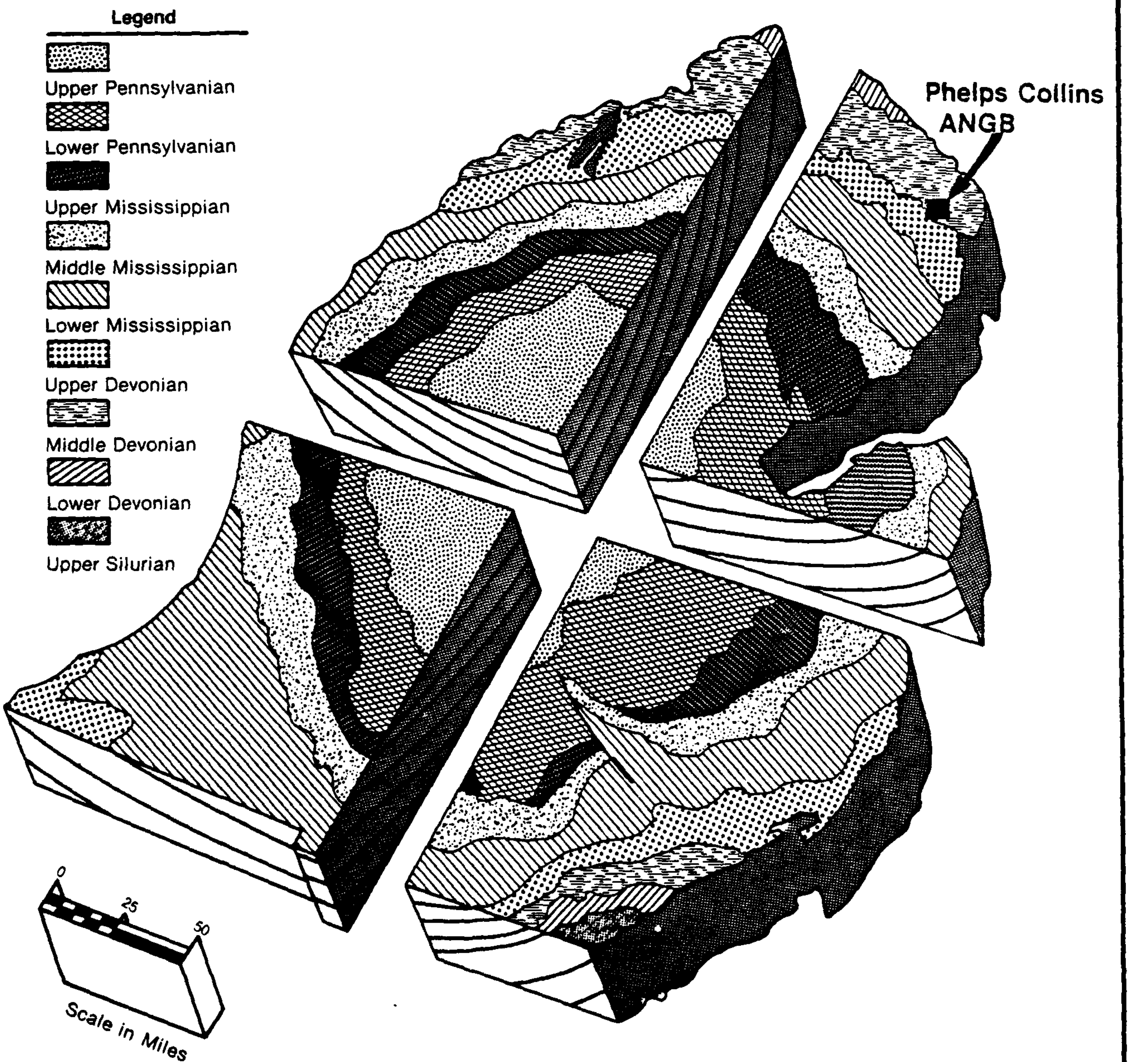
B. Geology

1. Regional Geology

Phelps Collins ANGB, along with most of the State of Michigan, is located within a broad geologic feature called the Michigan Basin. This basin began forming during the Precambrian period (over 600 million years ago), when the earth's crust in this region began to subside. As a result of this broad subsidence, the region became flooded by relatively shallow inland seas. Sediments which were eroded from the surrounding uplands were deposited within the basin. These processes occurred simultaneously throughout much of the period between 300 and 600 million years ago, thereby resulting in the accumulation of layers of sediment which dip slightly toward the central portion of Michigan. Figure 6 illustrates general surface and cross-sectional views showing the regional structure of these sediments. After being deposited, the

Figure 6.

HMTC Surface and Cross-Sectional Views Showing Distribution of Paleozoic Rocks Beneath the Glacial Cover in the Lower Peninsula Portion of the Michigan Basin



sediments became lithofied (turned into rock). The resulting rocks have different characteristics, depending on the sediments which formed them, and are classified and named on the basis of these characteristics. Figure 7 is a more detailed geologic map which shows the near-surface distribution of the various bedrock types and the identifying names given to them.

A relatively recent event which greatly affects the geology near the base was the development of continental glaciers beginning sometime between 0.5 and 2 million years ago. As a result of this glaciation, large amounts of unconsolidated sediments consisting of clay, silt, sand, gravel and boulders were deposited directly on top of the consolidated sedimentary bedrock. These unconsolidated sediments are frequently classified according to the mode by which they were deposited. Some glacial sediments were dropped directly from the ice; others were deposited in lakes and by flowing streams associated with the glaciers. Subsequent movement of the ice sheets often formed the sediments into arch-like mounds and ridges called morains. Figure 8 is a glacial map of Michigan showing where the different types of glacial deposits are located. Comparison of Figure 8 with Figure 7 indicates that a majority of the previously discussed sedimentary bedrock near the base is covered by unconsolidated glacial deposits.

Note that no mention has been made of any geologic formations between 2 and 300 million years old. This gap in the geologic record is referred to as the "lost interval" because there are very few rocks in Michigan (none near the base) within that timespan. Much of Michigan was emergent during this period, and therefore was undergoing erosion rather than deposition.

2. Local Geology

Few reports are available which describe the geologic setting in the immediate vicinity of Phelps Collins ANGB; however, the logs of wells and boreholes located on the base provide some useful descriptions of the site-specific geology. These logs indicate that the unconsolidated glacio-lacustrine deposits at the base range in thickness from 45 to 61 feet.

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Figure 7.
Bedrock Geologic Map of Michigan.

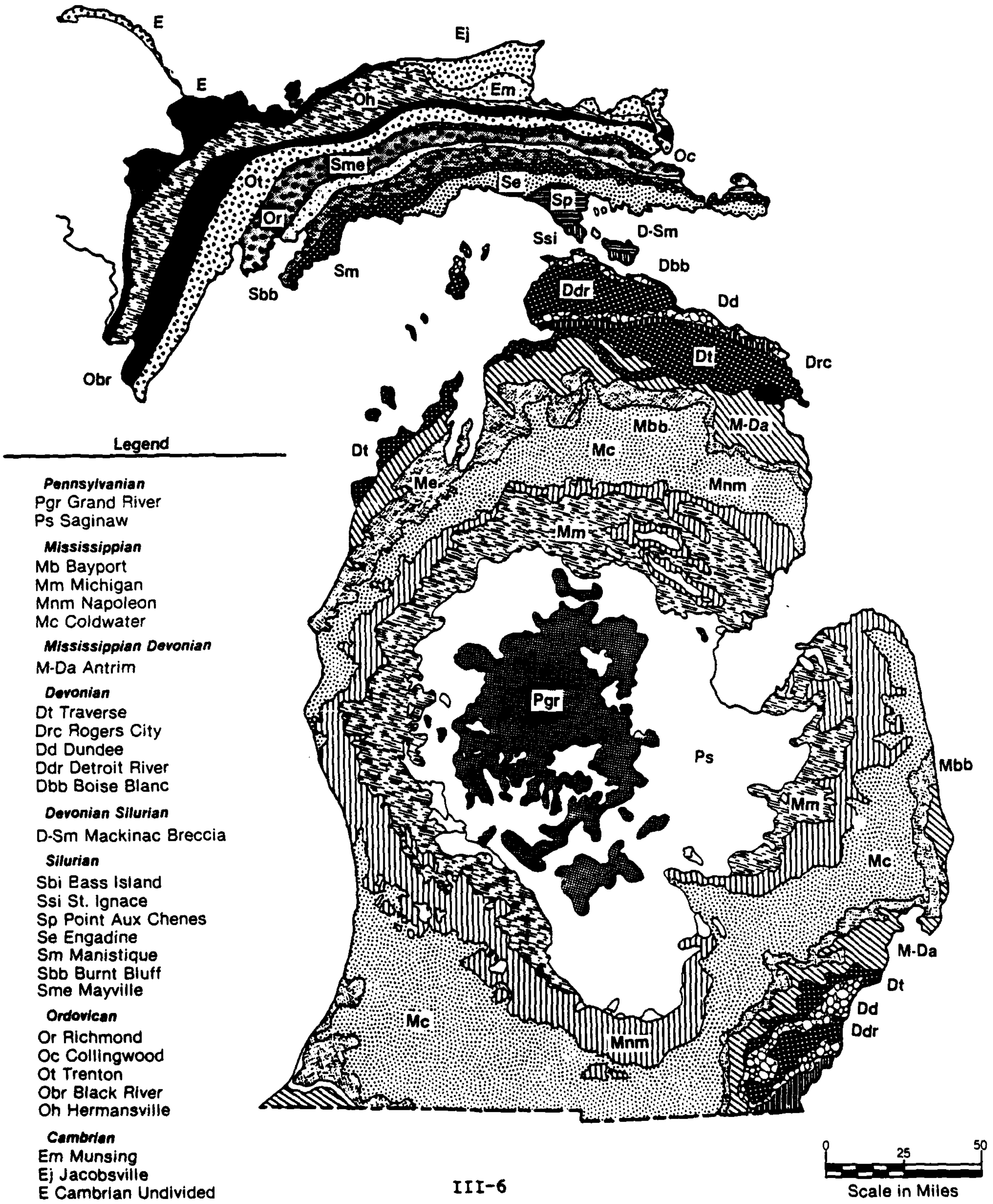

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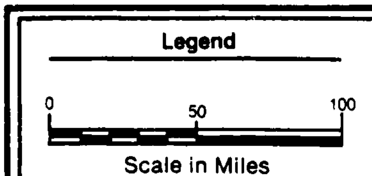
Figure 8.
Glacial Map of Michigan.



No reliable trends regarding the thickness of these sediments are apparent from the data. They have variously been described in drillers' logs as sand, or gravel and sand; however, the vertical and horizontal distribution of major zones of sand and/or gravel are not known. Because much of these sediments near the western border of the base have been reworked by the South Branch stream system, it is probably safe to assume that erosional and depositional features typical of rivers, such as buried channels and flood plain deposits, are present in this area.

The bedrock which immediately underlies the unconsolidated deposits is fractured limestone comprising a thick sequence of predominantly limestone formations known as the Traverse Group. Figure 9 presents the stratigraphic location of the Traverse Group. The onbase wells drilled into this underlying limestone are wells 1, 4, and 5. Although the exact depths at which limestone was first encountered are not recorded for all of the wells, the well log for well 1 does record the occurrence of fissured limestone beginning at 45 feet. Well 5 is a rather deep well (190 feet) which is reportedly within the Bell Shale between 135 and 190 feet. (The Bell Shale is a formation within the lower portion of the Traverse Group.) Table 2 summarizes the construction details, water yield, and yielding formations of the existing onbase wells. The locations of these wells are shown in Figure 10.

An interesting feature at the base is a large sinkhole approximately 200 feet west of taxiway B. Black (1983 and 1984) discusses the numerous occurrences of sinkholes throughout Alpena County and other areas of northern Michigan. He notes that the sinkholes are most common within exposures of the Traverse Group and that these occurrences tend to form linear trends with southeast-northwest orientations. Such orientations are believed to be related to the preferential development of the sinkholes along regional fault zones within which circulating groundwater has resulted in the solution (dissolving) of evaporate deposits.

Several soil types have developed on the unconsolidated glacial deposits. The only available soil survey for Alpena County (Wildermuth et al., 1924) categorizes the soils at the base into three general groups:

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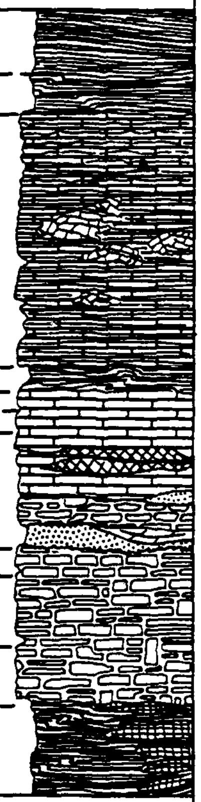
Figure 9.
Stratigraphic Map of the Northern Lower Michigan Karst Area.

Geologic Time	Group		Formation
Early Mississippian			Sunbury Shale Ellsworth Shale
Late Devonian			Antrim Shale
Middle Devonian	Traverse		
			Bell Shale
			Rogers City Limestone
			Dundee Limestone
	Detroit River	Mackinac Breccia	
			Bois Blanc
Early Devonian			Garden Island
Late Silurian	Bass Islands		
	Salina		



Limestone Dolomite — Reef Cherty — Shaley Shale — Dolomitic Sandy — Gypsum or Anhydrite Halite

Table 2.
Summary of Well Construction Details, Water Yield and Yielding Formations of Base Wells.

Well	Depth (feet)	Diameter (inches)	Static Water Level (Feet)	Water Yielding Formation	Date Drilled	Yield (gallons per minute)
1	54	---*	30/15	Fissured Limestone 45'-54', screened at 51'-61'	1942	250
2	61	8	22/12	Sand 25-61' Screened at 51'-61'	1942	100
3	36	---	---	"Gravel Well" Screened at 26'-36'	1982	76.3
4	150	---	16	Limestone "Rock Well" Screened at 140'-150'	1952	110
5	190	---	91/20	Bell Shale 135'-190'	1965	12
6	25	---	---	Sand	1979	10

*Dash - indicates no data available.

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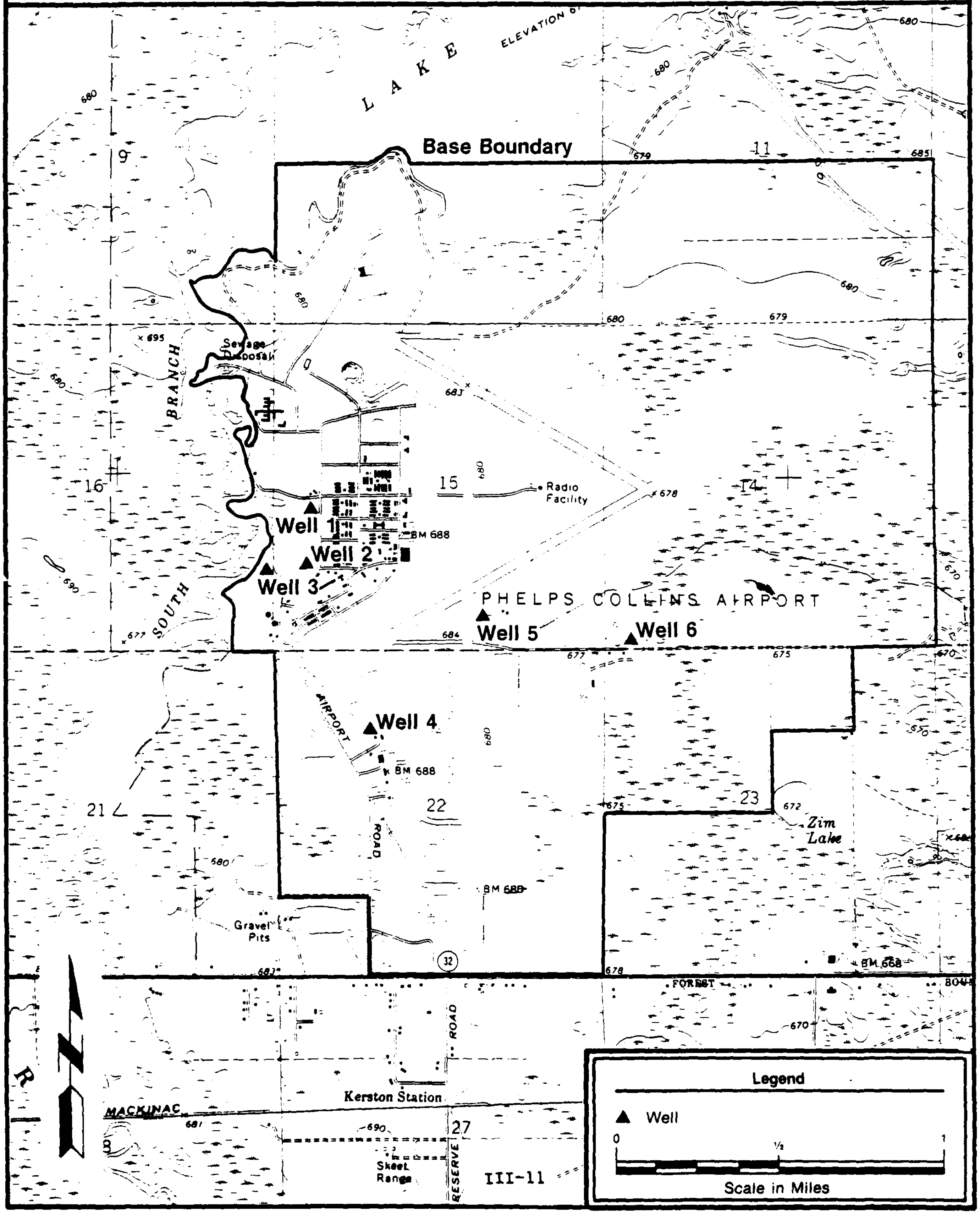
Figure 10.
Locations of On Base Wells.



1. Well-drained soils
    - Rubicon sand
    - Grayling sand
2. Mineral soils developed under conditions of deficient drainage
    - Saugatuck sand
    - Granby sand
3. Poorly drained soils - organic soils
    - Haughton muck
    - Rifle peat
    - Lupton muck

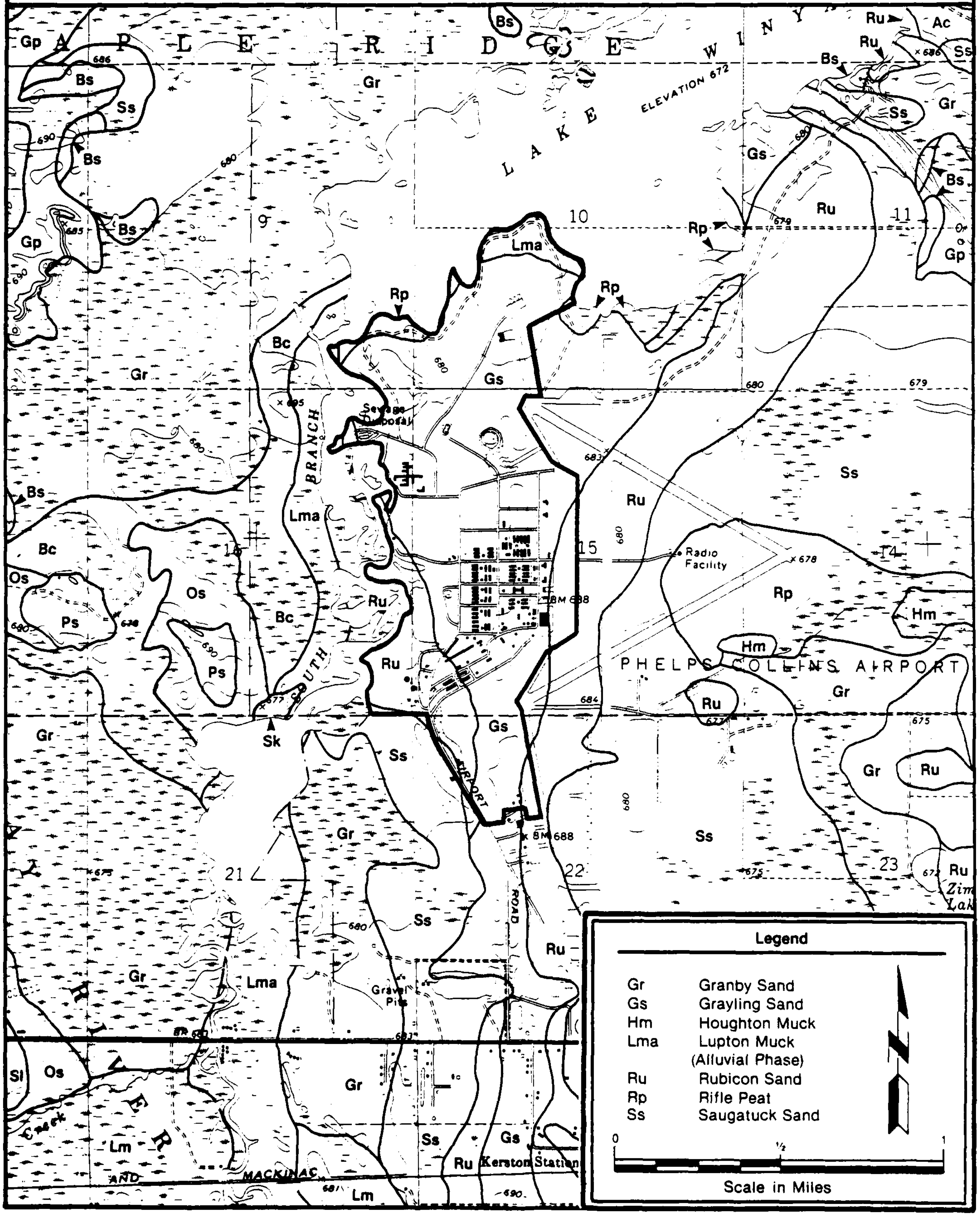
Figure 11 shows the locations of the soil types at the base. The descriptions below are taken from the Wildermuth survey.

Rubicon Sand

Virgin Rubicon sand consists of the following layers, from the surface downward: (1) A litter and humus surface layer derived largely from grass, shrubs, and leaf litter and underlain, at a depth ranging from 1 to 3 inches, by (2) light-gray sand, practically free of organic matter, from 4 to 8 inches thick; (3) a layer of brownish-yellow sand, slightly cemented and compact in places, from 6 to 12 inches thick; (4) a transitional layer of yellow or light-brown loose sand, from 6 to 15 inches thick; and (5) a basal layer of unconsolidated, loose pale-yellow or yellowish-gray sand mixed, in places, with gravel.

This soil is characterized by a marked development of the gray and brown layers. Organic compounds probably act as cementing material and are responsible for the coloring in the brown layer. The sand shows a marked acid reaction to a depth of 4 or more feet. The soil is loose and pervious above and below the brown layer.

Figure 11.
Map of Soils in the Vicinity of Phelps Collins ANGB.



This soil, as mapped, includes some areas of the Granby and Saugatuck soils, especially where it borders swampy land. The texture also is not uniform, with areas of fine and coarse sand included.

The total area of Rubicon sand is small. The soil occurs in small areas and tracts in the level sand plains and borders marshland. Some isolated islands and ridges occur also in the swampy areas.

Most of the Rubicon sand occurs in nearly level topography, but in places its relief is marked by low ridges of hummocks, probably the result of wind deposits or water action. The natural drainage conditions may be described as intermediate between those in the Saugatuck and Grayling soils. In places, the soil moisture is sufficient for agriculture. In others, drainage is excessive, and the soil water moves rapidly enough to pass below the reach of plant roots. The brown layer, however, tends to retain a greater quantity of moisture than the sand directly above or below it.

The original forest growth was largely white and Norway pines. Lumbering operations removed these trees, and the second growth which sprang up includes oaks, poplar, white birch, shrubs, and bracken. In places, the growth is dense enough to prevent satisfactory grazing.

Grayling Sand

Grayling sand in virgin areas is composed of the following layers from the surface downward: (1) A humus or mold layer about 1 inch thick; (2) a brownish-gray sandy layer which grades, at a depth of 4 or 5 inches, into (3) light-brown medium sand, merging downward into (4) unconsolidated lighter-brown or yellowish incoherent medium and coarse sand and gravel. Gravel generally occurs on the surface and through the soil, although in areas in the southern part of the county the quantity is not noticeable. In places the texture is finer than typical, and in such areas the subsurface soil generally is more loamy. Some inclusions of Rubicon sand have been mapped with Grayling sand along old shore lines where areas occur as narrow, shallow depressions between higher parallel sand ridges.

The gray layer that is so strongly developed in the Rubicon and Saugatuck soils is only moderately developed in the Grayling and in places is exceedingly faint. Grayling sand is acid to a depth of 4 or 5 feet. It is loose and pervious throughout and contains only minute quantities of silt or clay. When cleared and cultivated the organic surface soil disappears through the mixing of the upper layers, and the soil has a brownish-gray color.

Grayling sand has its largest distribution in the eastern part of the county, where the largest areas are long, narrow strips. The surface varies from nearly level to slightly ridgy or faintly undulating. The natural drainage is excessive because of the looseness and openness of the soil material.

Saugatuck Sand

Virgin Saugatuck sand consists of the following layers, from the surface downward: (1) An organic layer, from 2 to 4 inches thick; (2) light-gray sharp medium sand, from 10 to 15 inches thick; (3) a layer of brownish-yellow, rust-brown, or coffee-colored slightly loamy sand, almost everywhere cemented to form a hardpan layer, and from 4 to 15 inches thick; and (4) pale-yellow and gray mottled loose, incoherent or moist sand.

On the most elevated areas or where drainage conditions are fairly good, the soil in many places does not show the cementation common in areas that remain water-soaked for long periods. The soil, as mapped, includes small areas of Granby sand and Rubicon sand. Cultivated fields, in which the brown subsurface layer is frequently brought to the surface by plowing, present a surface variegated with different shades of gray and brown.

This soil is highly acid to a depth of 4 or 5 feet, especially in the brown layers. It is low in fertility. Chemical analyses by the Michigan State College of Agriculture show low percentages of calcium, phosphorus, and potassium.

Saugatuck sand is found on lake plains, outwash plains, and stream terraces. Most of the areas are small, occurring in association with other sandy soils. The largest area in the county is between Devil's Lake and Lower South Branch.

Areas of Saugatuck sand have a nearly level surface. The drainage of the surface soil varies, depending on the location. At times the surface is wet, and again it is dry and loose. Internal drainage is retarded to a varying extent, depending on the height of the water table. This commonly is 2 or 3 feet below the surface. Where it occurs close to the surface, the soil under virgin conditions is nearly always moist or wet.

Granby Sand

Granby sand includes the soils with black or dark-brown surface material or more or less thoroughly decomposed organic matter, containing grains of quartz, underlain at a depth ranging from 3 to 10 inches by grayish or dingy-white moist, incoherent sand.

The surface layer varies in thickness and is not uniform over any large area. In places, on the slightly higher ridges, the surface layer is dark-gray loamy sand or fine sandy loam underlain by loose gray sand. The content or organic matter in these areas is low in comparison to that in wetter areas. The texture of the subsoil varies, also, and different borings show a range from fine to coarse sand. The sand in this soil is from 4 to 6 or more feet thick. In some areas, including narrow, long depressions, muck is underlain by gray sand at a depth of only 12 or 15 inches, but it was impractical to differentiate these areas on the soil map. Granby gravelly sand has been mapped with Granby sand. The gravelly sand consists of a layer, from 2 to 4 inches thick, of muck or organic matter mixed with sand, underlain by light-gray gravelly sand which in places becomes coarser with depth. Areas of Granby sand along Lake Huron are alkaline in reaction. In places, a drab clayey layer containing small limestone fragments occurs, and in other places limestone bedrock lies at a slight depth.

The largest areas of Granby sand are along Thunder Bay River and Lower South Branch. Many long, narrow belts are in the plain area along the lake. Numerous small areas occur in poorly drained locations throughout the county.

All of this land is low, but the surface is relieved in places by small ridges and shallow, narrow swales on old lake beds. Granby sand also has been developed on flat, poorly drained sand plains and along the borders of lakes and muck swamps. Consequently it is poorly drained. It has a high water table, in places within 2 feet or less of the surface.

Organic Soils

The organic soils consist chiefly of plant remains in various stages of decomposition. They comprise a large total area in Alpena County. Many of the larger areas are probably former lakes now filled with plant remains. Some are flat, poorly drained areas, slightly depressed below the adjoining country, into which there has been a gradual accumulation of organic matter. Greenwood peat, Rifle peat, Houghton muck, Edwards muck, and Lupton muck, with an alluvial phase, have been differentiated on the basis of readily recognized differences in characteristics, such as color and texture.

Houghton muck. -- Houghton muck has a thin surface layer of brownish, fibrous, loose, stringy material grading into black or dark-brown fine, smooth, well-decomposed muck. Variations in the stage of decomposition occur, so that over the same area the soil is not uniform. Around the margin of the marshes different quantities of mineral soil from adjoining higher land have been washed in and incorporated with the vegetative matter. The muck has been formed from sedges, grasses, and aquatic vegetation.

The native cover is principally marsh plants such as wire grass, cat-tails, various reeds, and rushes. Alder, aspen, and willow are also present in places.

Only a few small areas of Houghton muck have been mapped in several parts of the county. None of the soil is utilized, and at present it offers little inducement for agricultural use.

Rifle peat. -- Rifle peat has a brown or dark-brown fibrous, rather loamy surface soil of organic matter, grading at a slight depth into brown, more fibrous or less decomposed material. The color and extent to which the vegetable matter has decayed are variable.

Generally the peat deposits are more than 2 feet and in some places are from 10 to 20 feet thick. The mineral material underneath the soil differs with the location, but for the most part is sand.

Lupton muck, alluvial phase. -- The alluvial phase of Lupton muck is variable and consists of black or dark-brown organic matter, in different stages of decay, mixed with material deposited by water. In places it is composed of black, finely divided, silty muck rich in organic matter over bluish, plastic silty clay or clay, and is from 10 to 20 inches thick. This muck occurs in low places along streams where it is subject to overflow. Flooding prevents agricultural development, and the high water table makes drainage difficult.

Elm, ash, alder, willow, and soft maple are the predominant trees in the forest growth. Some grass and other herbaceous vegetation of small growth occur where the trees have been cleared off.

Table 3 summarizes the important physical and chemical properties such as permeability, potential for erosion, and hydrologic classifications of the soil types.

Table 3.
Physical and Chemical Properties of Soils at Phelps Collins ANGB.

Soil Classification	Map Symbol	Depth (in)	Water Erosion Factors K	Water Erosion Factors T	Wind Erosion Group	Hydrologic Group	Permeability (cm/sec)
Granby Sand	Gr	0-4	.17	5	2	A/D	$4.2X10^{-3} - 1.4x10^{-2}$
		0-4	.15	5	1		$4.2x10^{-3} - 1.4x10^{-2}$
		0-4	---	5	2		$1.4x10^{-4} - 4.2x10^{-3}$
		4-60	.17	5			$4.2x10^{-3} - 1.4x10^{-2}$
Grayling Sand	Gs	0-15	.15	5	1	A	$4.2x10^{-3} - 1.4x10^{-2}$
		15-60	.15				$4.2x10^{-3} - 1.4x10^{-2}$
Houghton Muck	Hm	0-39	---	2	2	A/D	$1.4x10^{-4} - 4.2x10^{-3}$
		39-60	---				$4.2x10^{-4} - 4.2x10^{-3}$
Lupton Muck (Alluvial Phase)	Lma	0-10	---	2	2	A/D	$1.4x10^{-4} - 4.2x10^{-3}$
		10-65	---				$1.4x10^{-4} - 4.2x10^{-3}$
Rifle Peat	Rp	0-4	---	2	5	A/D	$1.4x10^{-4}$
		0-4	---	2	2		$1.4x10^{-4} - 4.2x10^{-3}$
		4-60	---				$1.4x10^{-4} - 4.2x10^{-3}$
Rubicon Sand	Ru	0-6	.15	5	1	A	$4.2x10^{-3} - 1.4x10^{-2}$
		0-6	.15	5	2		$4.2x10^{-3} - 1.4x10^{-2}$
		6-18	.17				$4.2x10^{-3} - 1.4x10^{-2}$
		18-60	.15				$4.2x10^{-3} - 1.4x10^{-2}$
Saugatuck Sand	Ss	0-12	.15	4	1	C	$4.2x10^{-3} - 1.4x10^{-2}$
		0-12	.15	4	2		$4.2x10^{-3} - 1.4x10^{-2}$
		12-31	.15				$4.2x10^{-5} - 1.4x10^{-4}$
		31-60	.15				$4.2x10^{-3} - 1.4x10^{-2}$

K - Erosivity index; the higher the number, the greater the potential for erosion.
T - Maximum allowable loss of soil in tons/acre/year, without a corresponding loss in biomass production.
Wind Erosion Group - Erosivity index; the lower the number, the greater the potential for erosion.
Hydrologic Group - An index (A through D) with reference to runoff-producing characteristics. Group A soils have the highest infiltration rate when thoroughly wet, and the lowest runoff potential. Group D soils have the lowest infiltration rate when thoroughly wet, and the highest runoff potential.

C. Hydrogeology

1. Surface Water

Because of the geologically young age of the surficial deposits on and surrounding Phelps Collins ANGB, surface drainage patterns are relatively poorly developed. Much of the land surrounding the base is classified as wetlands. However, well established drainage ways are developed west and north of the installation. Approximately coincident with the western boundary of the base is the South Branch of the Thunder Bay River. The South Branch flows northward into Lake Winyah, which is immediately north of the base. Coincidentally, Lake Winyah marks the confluence of the South Branch with the Thunder Bay River. Here the Thunder Bay River is flowing southeastward toward the town of Alpena, located along the shore of Thunder Bay and Lake Huron.

Surface water drainage on the base is essentially bi-directional, as shown by the surface drainage map in Figure 12. To the west of the main north-south-oriented runway, drainage is westward toward the South Branch of the Thunder Bay River. To the east of this runway, drainage is generally eastward toward Muskrat Farm Lake. Surface drainage is encouraged throughout much of the installation by manmade drainage ditches.

2. Groundwater

The occurrence and movement of groundwater at the base is both complicated and poorly documented. The complexity is due in part to the presence of a solution-prone carbonate bedrock system which is inherently unpredictable. The poor documentation is because of the lack of groundwater wells in the area from which useful information could otherwise be obtained.

The available information indicates that a relatively shallow groundwater table aquifer is present. A static water level depth of only 6 feet was observed for this aquifer at well 2 in March 1973. This well is screened

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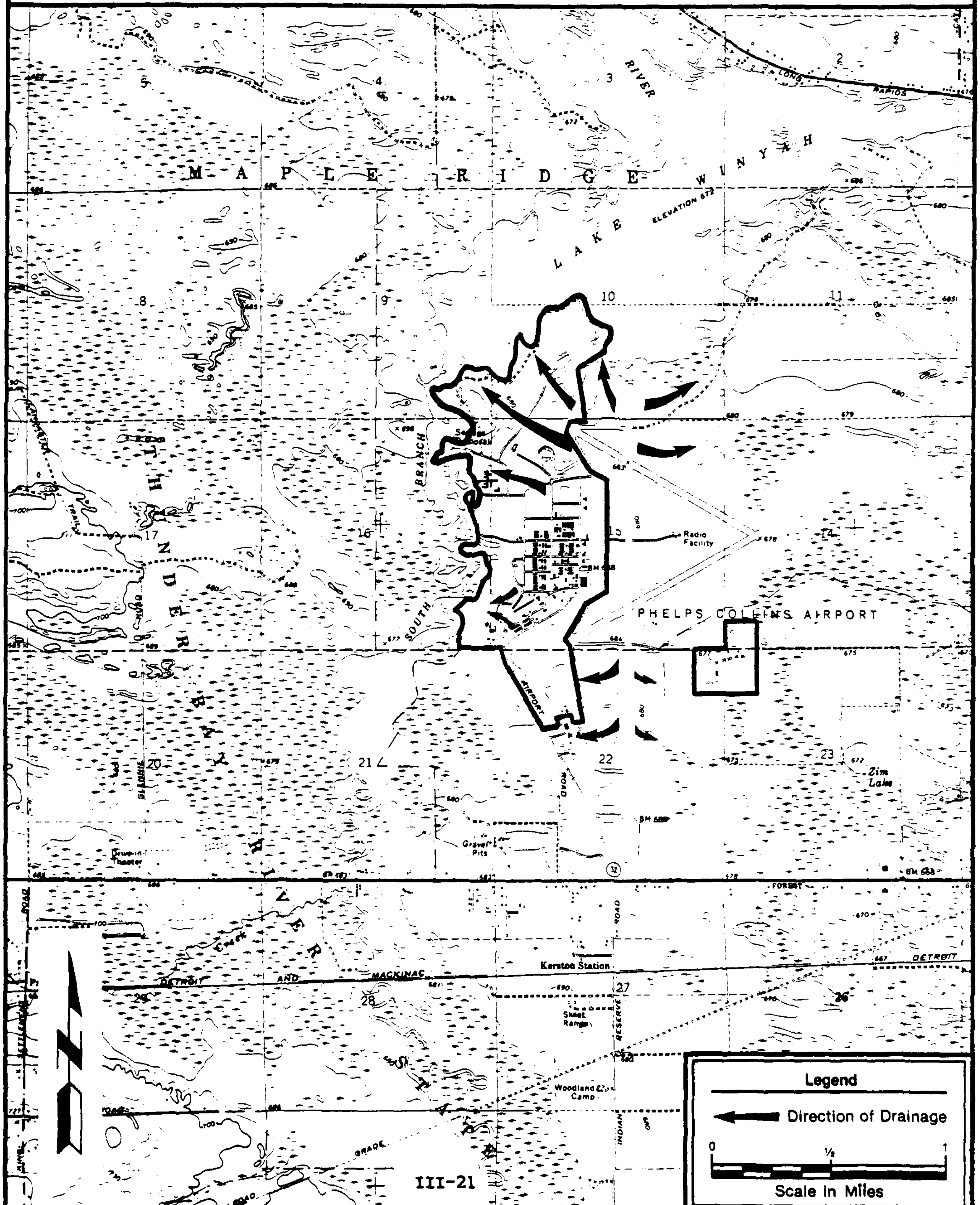
Figure 12.
Direction of Surface Drainage at Phelps Collins ANGB.



within the unconsolidated surficial deposits from 50 to 60 feet. Well 3 is also screened within these surficial deposits; however, the static water level for this well is not known. For those wells which draw water from intervals within the Traverse Formation (limestone bedrock), the associated static water levels range from depths of 15 to 20 feet.

The positive relationship observed between depths to static water levels and depths to the screened intervals indicates that the hydraulic gradient is downward. This in turn suggests that a deeper groundwater flow system may be present. Regional groundwater and geochemistry data (not presented in this report) suggest that an extensive deep groundwater flow system is associated within the Detroit River Group. This group of bedrock formations underlies the Traverse Group (see Figure 9). The top of the Detroit River Group occurs at an estimated depth of 250 feet. Leakage from the shallow surficial aquifer into this Group probably occurs along a complicated system of well-developed fractures within the Traverse Group. Once the groundwater reaches the Detroit River Group it is highly probable that it follows the regional gradient towards Lake Huron. Submersed sinkholes with large volumes of groundwater discharging from them are well documented along the shoreline of Lake Huron. Also, the chemistry of this groundwater is indicative of the Detroit River Group.

Some of the regional data indicate that, in the vicinity of on-land sinkholes, downward movement of shallow groundwater is so rapid that a cone of drawdown develops within the shallow aquifer in the vicinity of the sinkhole, in a manner similar to what occurs around a pumped well. The present site-specific data are of insufficient detail to determine the effect, if any, that the sinkhole present at the base has on the shallow water table aquifer. The data are also too scant to determine the groundwater flow direction within the shallow aquifer. It is highly probable, however, that the flow direction is toward the South Branch and Lake Winyah.

D. Environmentally Sensitive Conditions - The Ecosystem, Vegetation, and Wildlife

Phelps Collins ANGB is typical of an ecotone, located between the temperate deciduous forest biome (predominating to the south) and the northern coniferous forest biome (predominating to the north). Dominant tree species which typify their respective biomes are frequently found in combination at various sites in this area. More common deciduous species include: beech, birch, maple, elm, ash, poplar, oak, alder, and willow. Common conifers in the area are pines, spruce, hemlock, larch, and fir. Open areas are dominated by annual grasses and berry shrubs (blueberry, huckleberry). Some fauna supported by this habitat include the moose, caribou, elk, bear, mountain lion, bobcat, timber wolf, white tailed deer, marten, fisher, porcupine, heather vole, red-backed vole, fox squirrel, grey and red squirrel, raccoon, opossum, striped skunk, white-footed and deer mouse, eastern mole, and shrew. A variety of birds inhabit the area, including the Canada jay, yellow warbler, northern flick, hairy woodpecker, brown-capped chickadee, goshawk, great horned owl, spruce grouse, and wild turkey. Migratory birds are also common.

Invertebrates commonly associated with the area include blackflies, no-see-ums, mosquitoes, and mayflies. The cold winters require most invertebrates to hibernate and limit the number of species of amphibians and reptiles.

In addition to the general biome types, there are also two types of aquatic ecosystems. One involves still bodies of water (lentic environments) and would include the sinkhole located near the north end of the base, and the acid bog lake or pond located next to Thunder Bay River on the northwest end of the base. The other type involves moving waters (lotic environments) and is represented by the south branch of Thunder Bay River on the west boundary of the base, and a large drainage ditch which leads to the river. Fishing is said to be good in the river, and the drainage ditch is reported to have

varieties of small fish and other organisms living in it. The aquatic ecosystems tend to be rather sensitive to pollutants since the water can often act as a solvent and mode of transport for their migration. In addition, aquatic habitats are often home to many small organisms which provide the cornerstone for local food chains.

The acid bog pond at the base may be of particular interest. Owing to physical and chemical characteristics which attenuate the decay of organic matter, such lakes accumulate large amounts of undigested organics and the pH of the water is generally low, sometimes less than 4.0 (Benton, 1974). Being fairly acidic, the water becomes a more effective solvent and mode of transport for many materials. Since this bog is said to be periodically flooded by the South Branch of Thunder Bay River, it may be assumed that any pollutants found in the bog area would occasionally be transported, via surface water flow, into Thunder Bay.

A check with the Michigan DNR wildlife biologist for the Alpena County region revealed that there are no endangered or threatened species of wildlife at the base.

4. FINDINGS

IV. FINDINGS

A. Activity Review

Table 4 summarizes the activities at Phelps Collins ANGB that use industrial chemicals and require the management of the resultant used materials or wastes. A review of base records and interviews with past and present base employees resulted in the identification of specific operations within each activity in which the majority of industrial chemicals are handled and hazardous wastes are generated. A brief description of these operations and best estimates of the quantities of wastes generated by each are provided in the following sections. Where available, information on specific past operations and industrial chemicals is included. Table 5 summarizes the major operations associated with each activity, provides estimates of the quantities of waste currently being generated by these operations, and describes the past disposal routes for the wastes. If an operation is not listed in Table 5, then on a best-estimate basis that operation produces negligible quantities of wastes requiring ultimate disposal. For example, where extremely small volumes of methyl ethyl ketone may be used on occasion, it commonly evaporates after use and, therefore, does not present a disposal problem in these instances. Conversely, if a particularly volatile compound is listed, then the quantity represents an estimate of the amount actually disposed of according to the method shown.

1. Aircraft Maintenance

Aircraft maintenance is performed in either the aircraft maintenance shops or in the hangar spaces. Since the base operates no aircraft of its own, these facilities are maintained in a state of preparedness for transient aircraft and visiting ANG units during training exercises. A variety of hazardous wastes is generated during routine facility upkeep and transient aircraft maintenance activities.

Table 4.
Summary of Activities at Phelps Collins ANGB which Use Hazardous Materials.

ACTIVITY	PERFORMING ORGANIZATION
Aircraft Maintenance	Training units using Phelps Collins ANGB
Ground Vehicle Maintenance	Training units using Phelps Collins ANGB, and permanent stationed ANG personnel at Phelps Collins ANGB
Fuel Management	POL
Facilities Maintenance	Civil Engineering

Table 5.
Shops which Generate Hazardous Waste/Used Hazardous Materials.

Shop Name	Bldg. No.	Hazardous Waste/ Used Hazardous Material	Estimated Quantity	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 Present
Aircraft Maintenance Shop	601-A	Engine Oils	100 Gal/yr	----RDOIL--------→ DPDO* →
	601-D	PD-680	50 Gal/yr	
		JP-4	200 Gal/yr	----FIRE TR------→ DPDO →
Hanger Spaces	601-B, 601-C, 603, 604, 605, 607	JP-4	1000 Gal/yr	--- FIRE TR----→ DPDO →
		TCE	100 Gal/yr	--- SEP --→
AGE	417	Engine Oil	100 Gal/yr	
		Hydraulic Oil	50 Gal/yr	--FIRE TR--→ RDOIL --→ DPDO →
		PD-680	50 Gal/yr	
		JP-4	50 Gal/yr	
		Battery Acid	10 Gal/yr	------- NEUTR- -----→ DPDO →
		Paint/Stripper Cans	20 cans/yr	——— MFIL ——→
Motor Pool	7	JP-4	150 Gal/yr	-----FIRE TR------ → DPDO →
		Engine Oil	300 Gal/yr	-----RDOIL------→ DPDO →
		PD-680	50 Gal/yr	
		Battery Acid	50 Gal/yr	-----NEUTR-----→ DPDO →
		Slop Oils From Sump	1400 Gal/yr	-----DS- --------→ CNTRCT →
Roads and Grounds	6	Engine Oil	50 Gal/yr	---- -RDOIL--------→ DPDO →
Photo Lab	1, 23	Photo Chemicals	15 Gal/yr	——— DPDO ——→

RDOIL - Road Oil
FIRE TR - Fire Training
SEP - Drained to Septic System
NEUTR - Neutralized and Drained to Septic System
MFIL - Municipal Landfill
DS - Dry Sump
CNTRCT - Disposed of by Contractor
----Suspected method of Treatment/Storage/Disposal
——Known method of Treatment/Storage Disposal
* Redesignated as DRMS Effective 1 July 1985

a. Aircraft maintenance shops consist of Bldgs. #601A and #601D. Activities in these shops include machine/sheet metal work, avionics, hydraulics, tire work, welding, electrical/instrumental maintenance, and tool storage. The main wastes generated at these shops are waste engine oils (100 gal/yr), waste cleaning solvents (50 gal/yr), primarily PD 680, and waste JP-4 (200 gal/yr).

b. The hangar spaces consist of a maintenance dock and four alert cells that have been converted to aircraft maintenance areas. These areas are identified as Bays "B" and "C" of Bldg. #601 and cells 603 (#1), 604 (#2), 605 (#3), and 607 (#4). As a rule, one fighter-size aircraft can be enclosed in each of the six areas. The main waste generated at these areas is waste JP-4 (1,000 gal/yr), which is collected in overflow cans that catch fuel spilled from parked aircraft as a result of heat expansion.

c. Spectro Oil Analysis Program. Bldg. #320 houses the S.O.A.P. lab where very small quantities of used engine oils undergo chemical analysis. The only hazardous waste generated here consists of used engine oils (1 gal/yr).

2. Ground Vehicle/Equipment Maintenance

a. Aerospace Ground Equipment Maintenance (AGE Shop)

The AGE shop located in Bldg. 417 maintains ground equipment to support aircraft. Painting is also done in this shop. Wastes generated include used engine oils (100 gal/yr), used hydraulic oil (50 gal/yr) paint stripper (5 gal/yr), PD 680 (50 gal/yr), small amounts of JP-4 (50 gal/yr), and battery acid (10 gal/yr).

b. Motor Pool

The base motor pool is located at Bldg. #7. Routine maintenance of base ground vehicles produces the following hazardous wastes: waste JP-4

(150 gal/yr), used oils (300 gal/yr), PD-680 (50 gal/yr), battery acid (50 gal/yr), shop oils from oil sump (1,400 gal/yr).

c. Paint Booth

Bldg. #320 houses a paint booth used for ground equipment. Hazardous waste generated here consists of waste paint (50 gal/yr).

3. Fuels Management

Fuels stored and dispensed at the base are JP-4 jet fuel, MOGAS, and No. 2 fuel oil. Storage of JP-4 is accomplished in above-ground tanks with a total capacity of 447,000 gal. Refueling equipment consists of eight refueling units, each with a 5,000-gal capacity.

MOGAS is stored and dispensed to ground vehicles at Bldgs. #18 and #417. Bldg. #18 is the ground vehicle gas pump house and storage at the site is provided by a 5,000-gal underground tank. The AGE maintenance shop is located at Bldg. #417, and an underground 1,000-gal tank is used for MOGAS storage and dispensing to ground vehicles here.

No. 2 fuel oil is used throughout the base for heating, and is stored in both above- and underground storage tanks of varying sizes. The POL area also maintains three 10,000-gal above-ground storage tanks.

Appendix F contains an inventory of all fuel storage tanks in place at Phelps Collins ANGB.

4. Base Photo Labs

The base has two photo labs located in Bldg. #23, west wing and Bldg. #1. They have basic black and white equipment consisting of EN-53 enlarger, ektamatic 214 processor, EL-4 negative drier, pako 26 electric drum drier, RC paper drier and pako revolving tank washer. Waste photo chemicals generated in these labs consist of fixers and developers (30 gal/yr).

5. Civil Engineering

a. Water and Electric Utilities

Drinking water supplies and wastewater treatment services are provided on base.

Six wells comprise the water supply system. At the present, well #1 provides all the water entering the supply system at Bldg. #40 where water treatment takes place. Chlorine and some lab chemicals are used at this facility, but there have been no problems with loss or leakage.

Wastewater is treated at Bldg. #45 by an activated sludge system. Sludge from the system is placed in drying beds next to the treatment plant. After a drying period lasting from 6 to 8 months, the sludge is sampled for heavy metals and other parameters required by the State DNR. If the sludge passes the necessary requirements, it is worked into the ground at a site on the northwest area of the base adjacent to the Thunder Bay River. So far, the sludge has never had problems passing the requirements for ground surface disposal. Before 1972, when this sewage treatment system was put into use, the base's wastewater was treated by an Imhoff wastewater treatment system. After the present system was installed and in use, the Imhoff tank was backfilled in place.

The electrical distribution system, consisting of overhead transmission lines and transformers, is owned and operated by the Air National Guard. Power is supplied by Presque Isle Power Company.

b. Heating

Building heat at Phelps Collins ANGB is provided by No. 2 fuel oil, natural (bottled) gas, and electricity.

c. Pest Management

Pest management at the base is confined largely to mosquito and weed control. Mosquitos are controlled with malathion (40 gal/yr) and weeds around fences, hydrants, lights, etc. are controlled with commercial weed killers (200 gal/yr). These chemicals are stored and dispensed from Bldg. #6.

d. Roads and Grounds Maintenance

Equipment for roads and grounds maintenance is housed in Bldg. #6, the roads and grounds shop. Tractors, owners, sprayers, etc. are served in Bldg. #6, where the main waste generated is waste motor oil (50 gal/yr). Stoddard cleaning solvent is also generated (10 gal/yr).

6. Fire Department Training

Three locations have been used for fire training at Phelps Collins ANGB since WWII.

The first training site was located on the east edge of the solid waste dump adjacent to the south branch of Thunder Bay River. This area was used from approximately 1952 until the mid-1960's. An average of ten fire-fighting exercises were held each year between 1952 and 1954. Each exercise used 150 to 500 gal of waste fuels, oils, and solvents per fire. After 1954, the frequency of exercises decreased to approximately two episodes per year, each using 150-300 gallons of the same type of wastes per fire. This training site lacked any formal construction, and consisted of an open area without any containment structures, such as dikes or a paved bottom. Fuel for the fire was pumped directly onto the ground and ignited.

The second fire training area was located just north of the first training site, and was on the south side of another solid waste dump which was used primarily for kitchen wastes. This training site was operational from approximately 1965 to 1974, during which time there occurred two or three fire

drills per year, each using up to 300 gallons of JP-4. Operation of these training sites was very similar to that of the first, in that no containment structures were used, and fuel was applied directly on the ground and ignited. Use of this site was discontinued in 1974 when the most recent training site became operational.

The third and most recently used fire training site was constructed specifically for fire training and includes earthen dikes and a concrete floor for fuel containment. It was built in 1973 and remained in use from 1974 to August 1984. During this period, drills were performed at a rate of about ten per year, each involving approximately 300 gallons of JP-4 pumped from a fuel truck. On one occasion, approximately 250 gallons of waste acetone was burned during a training drill.

B. Disposal/Spill Identification, Evaluation, and Hazard Assessment

Interviews with the 15 base personnel (Appendix C) and subsequent site surveys resulted in the identification of 15 past disposal/spill sites. Of these 15 sites, 7 have been determined to have the potential for contaminant migration (as determined in step 3 of Figure 1) and, therefore, have been further evaluated using the Air Force's Hazard Assessment Rating Methodology (HARM). Of the seven rate sites, four represent hazardous materials disposal sites and three represent hazardous materials spill sites. The rated disposal sites at the base are the three Fire Department training areas and the abandoned landfill coincident with the first Fire Department training area. The rated spill sites are the site of the former County maintenance garage, the ANG motor pool, and the ANG POL storage area.

The 15 identified past disposal and spill sites were screened based on the information obtained from the interviews and available records from the base and outside agencies. The decision tree process described in the Methodology Section of this report was applied to determine whether a potential exists for contaminant migration from these sites. Of the 15 identified sites, 7 were identified as having contaminant migration potential. The remaining eight sites were considered <u>not</u> to have significant potential for contaminant migration and, therefore, were eliminated from further evaluation.

Contaminant migration is considered minimal at the eight eliminated sites because of very small volumes of disposed material(s) and the inability to confirm by interviews the existence of a site. The seven sites with the potential for contaminant migration were then rated using HARM, which was developed for specific application to the Air Force Installation Restoration Program. HARM considers four aspects of the hazard posed by a specific site: the waste and its characteristics, the potential pathways for waste contaminant migration, the potential receptors of the contamination, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating. Copies of the completed rating forms are included in Appendix E. Table 6 summarizes overall hazard ratings for all rated sites.

The eight unrated sites were eliminated for reasons such as potential contamination being of a non-point source nature (i.e., oiling of installation roadways), exceptionally small volumes of associated hazardous waste, or the relatively non-hazardous nature of the spilled or disposed material. These sites are considered to pose little or no environmental threat.

The locations and descriptions of the eight unrated sites are discussed under subsection 3, "Miscellaneous Unrated Sites," in this chapter. The unrated sites are (1) the hazardous waste drum storage area, (2) the underground fuel storage tank next to Bldg. #7, (3) the location of the old salt pile, (4) the "mound" area next to taxiway C near the old county garage site, (5) the underground fuel tank next to the firestation, (6) the oiled roads, (7) the parking apron for refuelers, and (8) the old kitchen landfill.

Following are descriptions of each rated site, including a brief description of the rating results. For each site, the factors that most significantly influenced its HARM score are discussed. For all sites, certain common factors contributed to all scores. These factors are not repeated below, but include the nearby South Branch of the Thunder Bay River, use of the uppermost aquifer for drinking water, a generally shallow groundwater table and direct access of contaminants to it via the highly pervious soils and subsoils.

Table 6.
Summary of the Results of the Site Ratings.

Priority	Site No.	Site Description	SUBSCORES Receptors	Waste Character-istics	Pathway	Waste Mgmt. Practices	Overall Score
1	6	Former Solid Waste Landfill	65	100	68	1.0	78
2	7	First Fire Department Training Area	65	100	50	1.0	72
3	4	Third Fire Department Training Area	59	100	61	0.95	70
4	5	Second Fire Department Training Area	57	100	50	1.0	69
5	2	Motor Pool Area	67	80	68	0.95	68
6	1	P.O.L. Area	65	60	47	0.95	54
7	3	Former Site of County Garage	63	40	47	0.95	48

1. Rated Disposal Sites

a. Site No. 6: Abandoned Solid Waste Landfill (HARM Score: 78)

This site, identified as Site No. 6 in Figure 13, is located approximately 200 yards north of the sewage treatment plant, on the edge of the acid bog pond. The receptors, waste characteristics, pathways, and waste management subscores for this site are 65, 100, 68, and 1.00, respectively. The waste characteristics subscore received the maximum value because of the large amount of high-hazard material known to have been disposed of at the landfill. Interviews with past and present base personnel revealed that wastes of all descriptions were placed in this fill, including paints, solvents, oils, waste fuels and anything thrown away during the years of its operation between 1952 and 1965. Another significant factor related to the scoring of this site is its close proximity to the acid bog which is adjacent to the South Branch of Thunder Bay River.

b. Site No. 7: First Fire Department Training Area (HARM Score: 72)

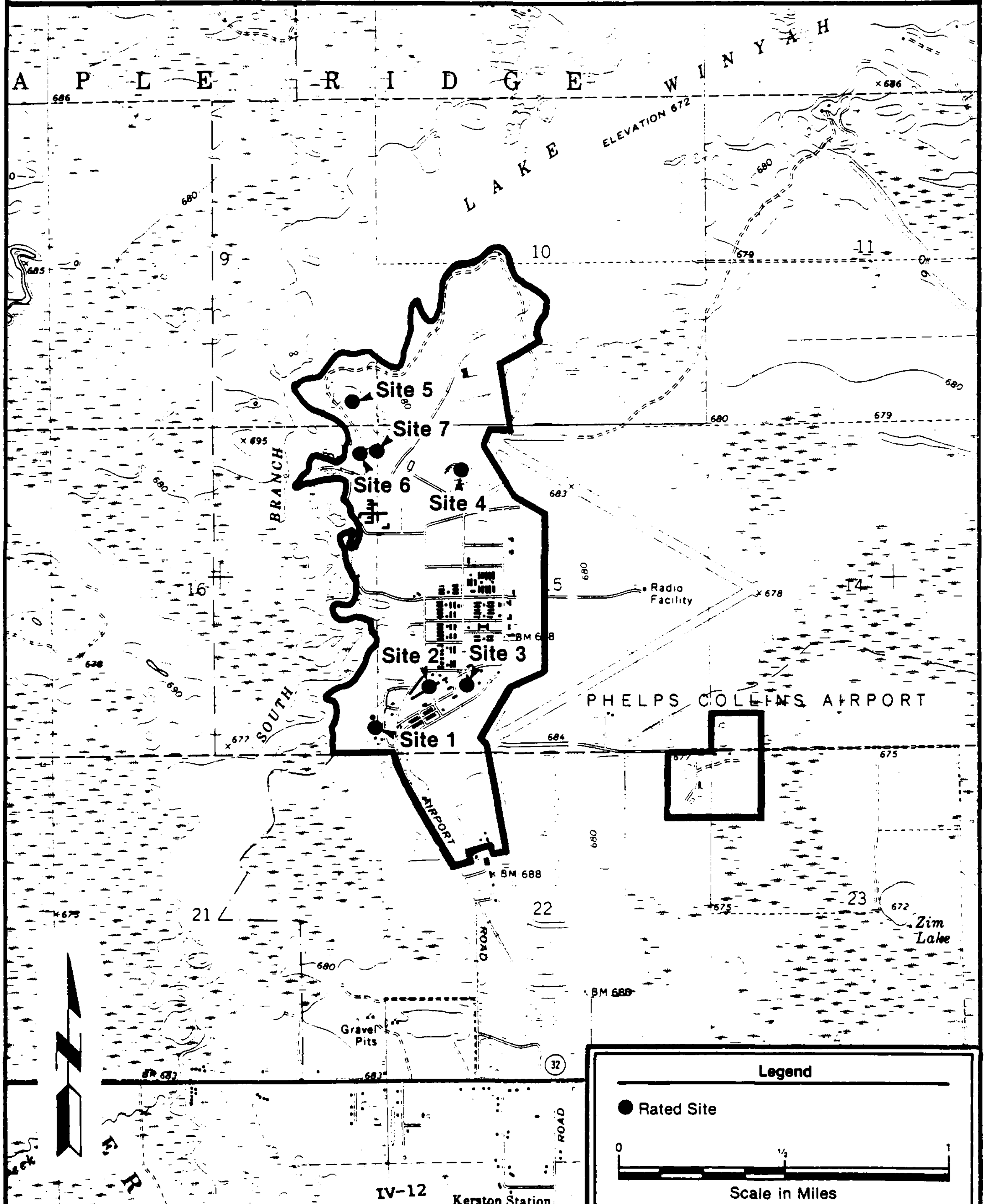
This site is identified as Site No. 7 in Figure 13 and is located along the east edge of the former solid waste landfill (Site No. 6). The receptors, waste characteristics, pathways, and waste management subscores for this site are 65, 100, 50, and 1.0, respectively. The waste characteristics subscore received the maximum value because of the large amount of high-hazard material known to have been disposed of in the burn area. The history of this site was discussed in Section IV A(6), and includes fuel quantity estimates. Also influencing the scoring for this site are the fact that no containment for the fire pit was provided and its close proximity to the acid bog.

c. Site No. 4: Third Fire Department Training Area (HARM Score: 70)

This site is identified as Site No. 4 in Figure 13 and is located approximately 500 yards east of Site No. 7. This is the most recently

HMTC

Figure 13.
Locations of Rated Waste Disposal and Spill Sites at Phelps Collins ANGB.



used Fire Department Training Area, and was closed in August of 1984. The receptors, waste characteristics, pathways, and waste management subscores for this site are 59, 100, 61, and 0.95, respectively. The waste characteristics subscore received the maximum value due to the large quantities of fuels used at this drill site. The waste management subscore is an intermediate value owing to the containment structures present at this training pit. Also of significance to this site is the relative closeness of the sink hole to the south (approximately 100 yards), which is said to occasionally receive surface runoff from the training pit.

d. Site No. 5: Second Fire Training Area (HARM Score: 69)

This site is identified as Site No. 5 in Figure 13 and is located approximately 150 to 200 yards north of Site No. 6. This site is in the south-central portion of a landfill area known as the "kitchen dump," because it is said to have received garbage from the mess halls up until the mid-1960s. Currently, the kitchen dump area serves as a dumping area for construction debris. The receptors, waste characteristics, pathways, and waste management subscores for this site are 57, 100, 50, and 1.00, respectively. As was the case for the first Fire Department training area (Site No. 7), the large quantities of high-hazard wastes associated with fire training activities, and proximity to the acid bog were factors of highest consideration in scoring this site.

2. Rated Spill Sites

a. Site No. 2: Motor Pool (HARM Score: 62)

This site, identified as Site No. 2 in Figure 13, is located approximately 100 yards north of Bldg. No. 4. The site includes Bldgs. No. 7 and 13, the paved area between them, and the drainage ditch running from the Motor Pool area, west to the south branch of Thunder Bay River. Also included at this site is the area where fire extinguishers were routinely emptied for recharging, under the present refueling bay on the southwest end of Bldg. No. 7. Interviews with base personnel indicated that for a period of about 10 years (1955-1965), up to 100 gal/yr of carbon tetrachloride (CCl_4),

chlorobromomethane (CBM), and protein foaming agents were dumped here. The receptors, waste characteristics, pathways, and waste management subscores for this site are 67, 80, 68, and 0.95, respectively. The close proximity of well No. 2 was of particular significance in scoring this site.

b. Site No. 1: POL Storage Area (HARM Score: 54)

This site is identified as Site No. 1 in Figure 13 and is located about 150 yards west of Bldg. No. 1. In May, 1983, an above-ground storage tank overflowed with JP-4 at this site. Interviews with the base personnel revealed that 500-800 gal were spilled and that nearly 90 percent of the spilled fuel was recovered within minutes of the spill. For the HARM score, the worst case situation was used. Soil sampling was performed after the spill cleanup and there is no evidence of contaminant migration. The Phase I site visit confirmed that no observable environmental stress resulted from the spill. The receptors, waste characteristics, pathways, and waste management subscores for this site are 65, 60, 47, and 0.95, respectively.

c. Site No. 3: Site of Former County Maintenance Garage (HARM Score: 48)

This site is identified as Site No. 3 in Figure 13 and is located about 100 yards east of the motor pool area (Site No. 2). From the late 1940s to approximately 1973, the county maintained a maintenance garage at this site. Phase I interviews revealed that the county ran a relatively "clean" operation at the garage, but that waste oils, etc., were frequently spilled on the floors, and also were used extensively for dust control around the garage parking lots and roads. The receptors, waste characteristics, pathways, and waste management subscores for this site are 63, 40, 47, and 0.95, respectively. The Phase I site visit revealed no sign of environmental stress at this site.

3. Miscellaneous Unrated Sites

The following sites were discussed and examined, and determined not to be in need of HARM rating or Phase II monitoring.

a. The Drum Storage Area - This site is next to the motor pool and serves as a storage area for empty 55-gal drums, and as an accumulation point for drums full of waste oils, solvents, and other wastes pending shipment to DPDO. During a site visit in August 1984 by a Michigan DNR geologist, questions were raised regarding discolored soil spots which may have indicated past spills or leaks. It was also noted that the area is gravel covered with no containment structures.

No evidence or testimony during Phase I interviews indicated that there had ever been a loss of wastes from the drums at this site. Furthermore, site examination revealed no evidence of past spills, leaks, or any environmental stress. Therefore, Phase II monitoring is not recommended at this site.

b. The Underground Fuel Storage Tank - This fuel storage tank is located next to building No. 7 in the motor pool area. The tank's capacity is 4,000 gal and the content is No. 2 fuel oil. During the DNR's August 1984 site visit, the size, content, and integrity of the tank were questioned. Phase I interviews and site examinations revealed no evidence of tank leakage or fill spills. It was noted that tank inventory is regularly taken, and that no losses have ever been reported. Therefore, no Phase II monitoring is recommended at this site.

c. Salt Storage Site - This area is located southwest of the old county garage site, and was the location of road salt storage. It was abandoned and dismantled approximately 10 years ago. The storage facility consisted of a three-sided wooden structure with no roof or ground liner. The DNR raised questions about this site after their site visit, primarily because of chloride contamination found in the water supply wells.

Phase I site examinations revealed no discolored soil or environmental stress at this site. Phase I activities also found that the ANG had done soil sampling at the site to a depth of approximately 12 feet, and that no evidence of elevated chloride levels had been observed here. Additionally,

since road salts are widely used during the winter for ice control and in the summer for dust control, it is thought that it would be difficult to designate this former storage site as a point source for chloride contamination. Therefore, Phase II monitoring is not recommended at this site.

It is appropriate to note here that, even though monitoring is not recommended for the three sites mentioned above, their close proximity to monitoring location No. 2 helps assure that in the unlikely event any contaminants should migrate from these sites, they will be detected during monitoring efforts conducted at M.L. No. 2.

d. South Drum Disposal Site - This site is situated to the east of the old county maintenance garage. Past allegations suggest that large quantities of drums were buried here, although the types and quantities of materials have not been speculated.

Phase I interviews and site examination did not support these allegations to any degree. Absolutely no evidence was uncovered that suggests any sort of drum burial at this site; hence, no Phase II monitoring is recommended.

e. Fire Station Fuel Tank Site - This site is on the west side of Bldg. No. 28, the fire station, where an underground fuel tank is located. Mention of this tank was made subsequent to the DNR site visit. Phase I interviews indicate that no spills or leaks have ever occurred at this site, and no environmental stress is evident. No monitoring is recommended here.

f. JP-4 Refueler Parking Apron - This site is on the west side of the runway apron and serves as a parking area for refueling units. The area is paved and drains to the west. There is no visual evidence of spills or leaks having occurred at this site, and Phase I interviews support the contention that no fuels have been lost here either by spills or leakage; hence, no monitoring is recommended.

g. Kitchen Dump - This site is coincident with disposal Site No. 4. It is at this site that kitchen wastes from the mess halls were disposed of up until about 1965. These wastes were innocuous and were covered by fill daily. No environmental stress is evident here, so no monitoring is recommended. If other than kitchen wastes were disposed of here, they most probably will be detected during the monitoring at Site No. 4.

4. Groundwater Monitoring

Groundwater quality has been monitored at Phelps Collins ANGB by various organizations. These include the U.S. Air Force's Occupational and Environmental Health Laboratory (OEHL) and the Michigan Department of Public Health (MDPH). Appendix G contains all of these analytical results. Part A of this appendix contains OEHL results for volatile halocarbons analyzed by EPA method 601. Part B of this appendix contains OEHL results for volatile aromatics determined by EPA method 602. Part C contains OEHL results for TCE. Part D contains OEHL results for the primary drinking water standards and metals screening. Part E, the last section, contains MDPH results for volatile halocarbons.

Table 7 summarizes the most significant findings contained in Appendix G, with regard to positive results. This table illustrates that well No. 3 has shown contamination by various halogenated organics, including trichloroethylene and chloroform. It is most severely contaminated in terms of the variety of organic compounds detected. This is not surprising because the screened interval for well No. 3 occurs at a depth interval of only about 25 to 35 feet, which is shallower than any other well that was monitored. This indicates that wells screened at greater depths may give misleading indications of the extent of shallow subsurface groundwater contamination. Well No. 4 also showed contamination by chloroform and trichloroethylene, although not at concentrations as high as those for well No. 3. Because well No. 4 is screened within the deep fractured limestone formation, the presence of contamination indicates that there are downward components of groundwater flow which are allowing shallow contamination to reach the deeper aquifers. Because

this limestone formation (Traverse Formation) is known to be fractured, it is possible that the observed groundwater contamination is hydraulically connected to the aquifer system within the Detroit River Group and, via this connection, could result in off-site groundwater contamination migration. It is not likely that this would pose a serious health problem considering the large amount of dilution that would occur before the shallow contaminated groundwater reached the Detroit River Group. Also, there are no users of Detroit River Group groundwater between Phelps Collins ANGB and Thunder Bay, into which groundwater from the Detroit River Group discharges.

Table 7.
Summary of Positive Results from Well Sampling.

	Well No. 1									Well No. 2							Well No. 3							
	7/6/83	3/21/84	5/18/84	6/13/84	8/7/84	9/6/84	9/10/84	9/11/84	9/13/84	7/6/83	3/21/84	5/18/84	6/13/84	7/9/84	8/7/84	9/10/84	7/6/83	3/21/83	5/18/84	6/13/84	7/9/84	8/7/84	9/7/84	9/13/84
* BENZENE	**																	2.1						
BROMODICHLOROMETHANE																							2.3	
BROMOFORM																							1.1	
CHLOROFORM																			0.2			0.2	5.0	
DIBROMOCHLOROMETHANE																							3.1	
1,2, DICHLOROBENZENE		18.0																						
1,3, DICHLOROBENZENE											8.1													
CARBON TETRACHLORIDE																	<0.3				0.4			
ETHYL BENZENE														8.2										
METHYLENE CHLORIDE																	<0.3							
TRICHLOROETHYLENE			<0.2														6.5		6.4	7.9	10.0	10.3	8.5	
TOLUENE																								
TETRACHLOROETHYLENE								TR						0.5							0.4			
1,1,1-TRICHLOROETHANE																					0.5			

* All results reported as micrograms per liter
** A blank space denotes none detected
TR - Trace amount detected

Table 7.
Summary of Positive Results From Well Sampling. (*continued*)

	Well No. 4									Well No. 5					Well No. 6				Bldg. No. 601			Bldg.*** No. 28					Bldg.*** No. 45		Sink Hole
	7/6/83	3/21/84	5/18/84	6/13/84	7/9/84	8/7/84	8/15/84	9/11/84		7/6/83	5/18/84	6/13/84	8/7/84		5/18/85	6/13/84	7/9/84		7/6/83		9/6/84	9/7/84	9/10/84	9/11/84		9/13/84		9/7/84
BENZENE		2.0																										
BROMODICHLOROMETHANE																			0.9			10.2	15.1	13.0				
BROMOFORM																			2.0			9.5	8.6	7.8				
CHLOROFORM						0.3	0.2	0.3											0.6			7.0	20.9	6.5				
DIBROMOCHLOROMETHANE																			2.3			17.5		18.4				
1,2, DICHLOROBENZENE																												
1,3, DICHLOROBENZENE																												
CARBON TETRACHLORIDE																						TR						
ETHYL BENZENE																										1.5		
METHYLENE CHLORIDE																			<0.3			TR						
TRICHLOROETHYLENE	<0.2	1.7			1.3		<0.2			0.3									4.3			9.1	8.4	8.7				
TOLUENE																												
TETRACHLOROETHYLENE					0.9			0.5																				
1,1,1-TRICHLOROETHANE					22																							

* All results reported as micrograms per liter
** A blank space denotes none detected
*** Buildings 28 and 45 were serviced by Well No. 3 at the time they were sampled
TR Trace amounts detected

5. CONCLUSIONS

V. CONCLUSIONS

- Information obtained through interviews with 15 past and present base personnel, review of base records, and field observations have resulted in the identification of a total of 15 past disposal and/or spill sites at Phelps Collins ANGB.

- Of these 15 sites 7 have been further evaluated using the Air Force's HARM. Eight of the original 15 sites were not evaluated using the HARM system because it is thought that they exhibited no potential for contaminant migration and, therefore, pose no significant hazards to health and welfare. A priority listing of these waste disposal and spill sites and their associated HARM scores has been presented in Table 6. No sites exhibit visible environmental stress.

- Evidence of groundwater contamination was discovered prior to the Phase I study via sampling done by OEHL and the MDPH. The overall groundwater environment at Phelps Collins ANGB is susceptible to surface contaminants. The primary factors contributing to this susceptibility are the highly permeable soils characteristic to the area, and the shallow aquifer systems.

- No evidence of off-base environmental stress from past waste material disposal was observed in the immediate vicinity of Phelps Collins ANGB. However, the close proximity of the sites to the south branch of Thunder Bay River increases the likelihood of off-base contaminant migration via the groundwater pathway leading to the south branch.

VI. RECOMMENDATIONS

The potential for contaminant migration at Phelps Collins ANGB is moderately high; therefore, it is recommended that Phase II monitoring be conducted. This monitoring should consist of analysis of soil and groundwater samples for selected organic and inorganic parameters. The primary purposes for monitoring each of the proposed locations are to:

- Determine the depth within the unsaturated zone to which contaminants have migrated. If only the shallow subsurface has been contaminated at a particular site, it may be possible to remedy the problem by excavating the contaminated material, if concentration levels warrant excavation.
- Determine whether groundwater at each monitoring site has been contaminated.
- Determine the extent of contamination and the rate and direction of contaminant migration, if groundwater contamination is observed.

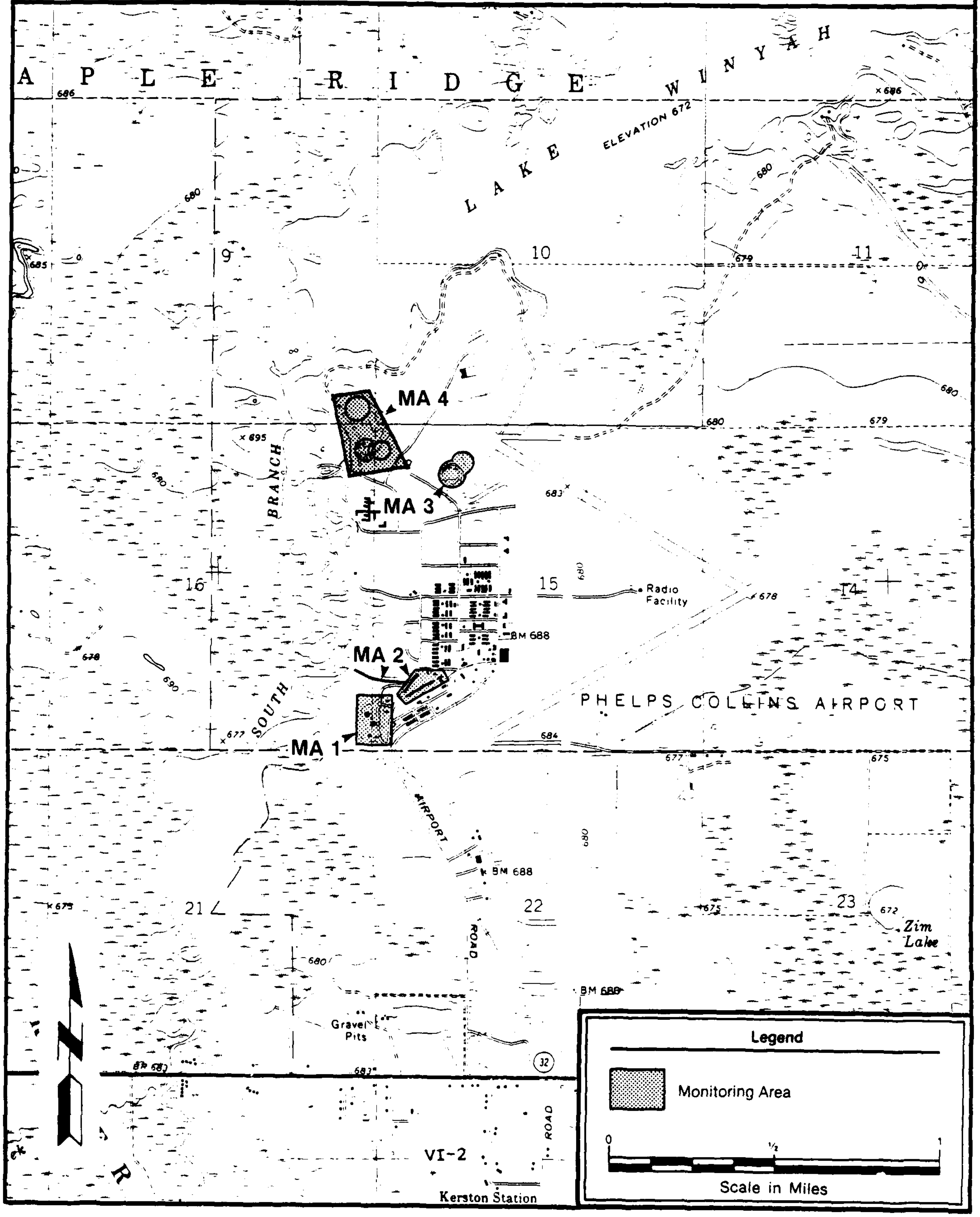
A. Locations To Be Monitored

Six of the seven rated sites are recommended for Phase II monitoring. These sites have been grouped into monitoring areas on the basis of their proximity to each other. Figure 14 illustrates the three general areas at Phelps Collins ANGB that are recommended for monitoring, and the locations of the spill/disposal sites within these areas. One of the proposed monitoring areas encompasses more than one spill/disposal site due to the close proximity of the sites. The first monitoring area encompasses the POL area (Site No. 1). The second monitoring area encompasses the motor pool area (Site No. 2). The third monitoring location covers the third or most recent Fire Department Training area (Site No. 4) and the sink hole. The fourth monitoring area encompasses the landfill site and the first and second Fire Department Training areas (Site Nos. 6, 7, and 5, respectively).

Site No. 3 (former location of county maintenance garage) is not included in any monitoring location because plans are underway to convert a significant

HMTC

Figure 14.
Locations of Proposed Areas of Phelps Collins ANGB to be Investigated During Phase II of the IR Program.



portion of the old county maintenance garage area into a major new POL distribution facility. As part of this effort, Phelps Collins ANGB is implementing an extensive groundwater monitoring program throughout this area to assess potential contamination caused by past maintenance activities. This program is being conducted independently of IRP Phase II; therefore, to avoid repetition, there are no additional Phase II IRP recommendations.

The following description makes it clear that currently planned monitoring exceeds any of the recommendations that would otherwise have been made as part of the Phase II IRP. The proposed new jet fuel storage facility, indicated in Figure 5, covers an area of approximately 200 feet by 200 feet. Within this area, 38 monitoring wells are to be installed. Seven of these are going to be deep monitoring wells with screened intervals within the carbonate bedrock which underlies the unconsolidated surficial wells, whose screened intervals are expected to coincide with the first occurrence of groundwater at an anticipated depth of approximately 7 feet. Such a dense groundwater monitoring network makes it very probable that any existing contamination will be detected and, therefore, no additional Phase II IRP monitoring efforts are recommended for this site.

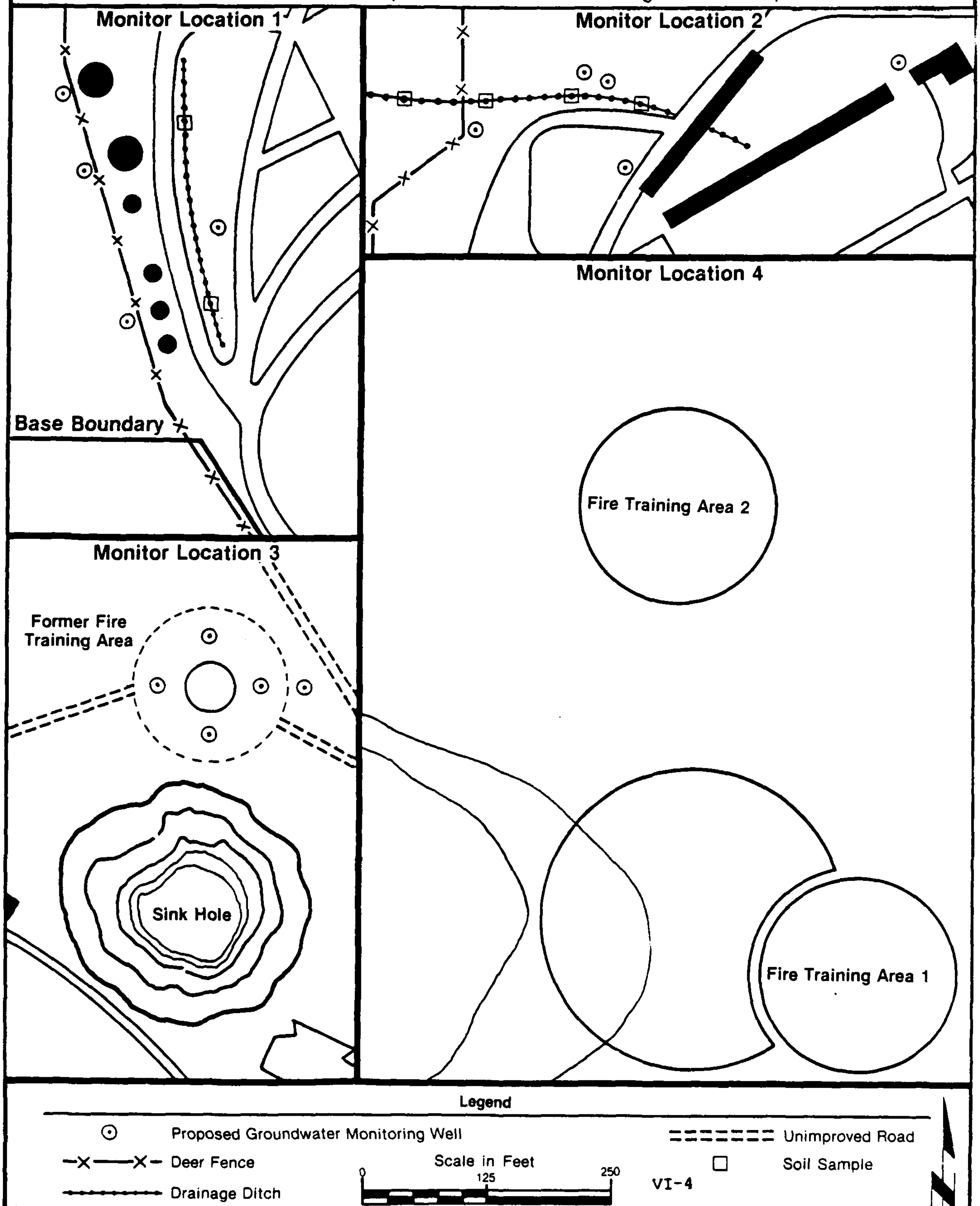
B. Site-Specific Recommendations for the Monitoring Locations

While reading the following site-specific recommendations, the reader should refer to Figure 15, the illustrated enlargements of each of the proposed sites to be monitored.

Monitoring Location No. 1

Monitoring Location No. 1 primarily includes only the existing POL storage and distribution area. Four shallow monitoring wells are recommended at this site as illustrated in Figure 15. During the site ground survey walk-through, no evidence of contamination was observed; however, wells are still being recommended to monitor for any subtle contamination which may have resulted

Figure 15.
Locations of the Proposed Groundwater Monitoring Wells within the Proposed Areas to be Investigated at Phelps Collins ANGB.



from the petroleum product spill which occurred at this site and, possibly, minor contamination associated with small spillages which may have been related to routine product handling. As well as providing chemical groundwater quality information, these wells will also provide physical groundwater data which should be helpful in determining the direction of movement of shallow groundwater at this area.

It is also recommended that shallow subsurface sediment samples (sediment samples SS-1 and SS-2) be collected from the drainage ditch which runs parallel to the POL access road, immediately adjacent to the primary storage tanks. No visual evidence of contamination was observed to be associated with this drainage swale; however, it represents a natural collection spot for surface-derived contamination and, for this reason, warrants investigation. Both the sediment samples and the groundwater samples should be screened for priority pollutants and oil and grease.

Monitoring Location No. 2

Monitoring Location No. 2 consists of the current motor pool area (Site No. 2), the fire extinguisher discharge and disposal area, and the storm water drainage ditch which directs surface runoff away from the motor pool area toward the south branch of the Thunder Bay River. Throughout this monitoring location, a total of five monitoring wells and four soil samples are recommended. The soil samples should be collected from the shallow subsurface along the above-mentioned drainage ditch using hand-augering techniques. These sampling locations are indicated in Figure 15. Each soil sample should be analyzed for priority pollutants, including carbon tetrachloride and trichloroethylene. This drainage ditch is being monitored because it drains a relatively industrialized area. Interviewees did not indicate that contaminants were placed into this ditch, but inadvertent contamination may have resulted. Groundwater contamination is also confirmed at well No. 3. The relatively close proximity of this ditch to well No. 3 makes the ditch suspect.

The monitoring wells recommended for this location include MW-5, MW-6, MW-7, MW-8, and MW-9. MW-5 is shallow and will be located immediately adjacent to the current refueler bay at the motor pool (Building No. 7). Several interviewees indicated that old fire extinguishers, possibly containing carbon tetrachloride, may have been disposed of at this location before construction of the refueler bay. These are possible sources of the carbon tetrachloride reported in well No. 3. Monitoring wells 6, 7, 8, and 9 are recommended at the locations indicated in Figure 15. Only well 7 is recommended to be deep (screened into the limestone bedrock). Basically, these wells are all downgradient of the motor pool area and are intended to better define the source(s) of contamination of well No. 3 and the impact (if any) of past activities associated with the motor pool area. Water samples from these wells should be screened for priority pollutants, at a minimum. Except for the deep well, the screened intervals should be coincident with the first occurrence of groundwater.

Monitoring Location No. 3

Monitoring Location No. 3 includes the No. 3 Fire Department Training Area and the sinkhole. At the fire training area, four shallow monitoring wells and one deep monitoring well are recommended (Figure 15). From each monitoring well, two soil samples should be collected and both the soil samples and water samples should be analyzed for priority pollutants, oil and grease, phenols, and metals. Additionally, the sinkhole should be sampled for similar parameters and the water elevation in the sink hole should be surveyed and compared to the water elevation in the deep monitoring well at this site.

Monitoring Location No. 4

Monitoring Location No. 4 includes the old landfill (Site No. 6) and Fire Training Area Nos. 1 and 2. Due to the relatively large amounts of hazardous materials which are known to have been disposed at the old landfill, 20

monitoring wells are recommended for this site. Since boundaries of the former landfill and fire training areas were not well defined, the exact locations for the wells are not illustrated in Figure 15; however, they are described below:

- o Five shallow monitoring wells (screened coincident with the first occurrence of groundwater) are recommended along the downgradient (toward the bog) perimeter of the landfill.

- o Five deep monitoring wells (screened into the limestone bedrock which underlies the unconsolidated overburden). These deep wells should not penetrate any of the original landfill material because, despite proper construction techniques, such wells could induce downward contaminant migration. Instead, these wells should be evenly spaced around the landward perimeter of the landfill. Unfortunately, such offsite positioning slightly decreases the capability of these wells to detect a deep contaminant plume. However, it greatly decreases the risk that highly concentrated shallow subsurface groundwater contamination will be granted direct access to the deeper aquifer along improperly grouted well bores.

- o Ten shallow monitoring wells are recommended throughout the area of the actual landfill. The exact locations should be determined on the basis of the geophysical studies currently being conducted at this site. For example, well locations should be approximately coincident with potential "hot spots" identified by the geophysical survey.

- o Two soil samples are recommended from each of the 10 shallow monitoring wells installed on the basis of the hot spots identified by the geophysical investigation.

At each of the fire training pits within this monitoring location, four monitoring wells are recommended, giving a total of eight monitoring wells associated with the fire training pits. At each training area, three wells should be located downgradient and one should be upgradient. Also, two soil samples should be collected from each monitoring well. The first soil sample should be from the very shallow subsurface and the second from a greater depth. Water and soil samples should be analyzed for priority pollutants, oils and grease, metals, and phenols.

C. General Monitoring-Well Construction Criteria

Selection of appropriate monitoring-well designs is the responsibility of the contractor for the Confirmation/Quantification Phase of the IRP. Designs selected by the contractor should facilitate determination of vertical

variations in parameters such as aquifer permeability, pressure head, and contaminant concentrations. Whether such data are acquired using, for example, nested piezometers or fully screened wells fitted with packers, is at the discretion of the contractor. Such information is important for determining the three-dimensional orientation and movement of the contaminant plume and for designing Phase IV Remedial Actions.

At a minimum, the well construction protocol should include:

- Tremie grouting of the annular space for each well to a depth of 5 feet below ground surface.
- Recording of detailed well logs which include daily static water levels, type of geologic materials encountered, depths to water-producing zones, and samples of cuttings from each well that are collected from 5-foot intervals.
- Proper identification and surveying of all wells.

D. Sampling Criteria

Groundwater from each screened interval for all wells should be collected and analyzed for volatile organic carbon species, oil and grease, total organic halogens, phenols, and heavy metals. The sampling protocol for all monitoring wells should include:

- Removal of a volume of water equal to at least three times the volume of the well below the saturated zone, before water sample collection.
- Use of stainless steel/teflon bailers and/or pumps for withdrawal of water.
- Acidification of samples to be analyzed for total metals.
- Use of glass containers for samples to be analyzed for oil and grease.
- Immediate refrigeration and transporting of the samples to the analytical laboratory.
- Appropriate chain-of-custody records.

All groundwater quality data should be statistically analyzed by methods approved by the U.S. Environmental Protection Agency and the Michigan Department of Water Resources in order to illustrate significant differences in ground- water quality.

ACRONYMS, ABBREVIATIONS AND SYMBOLS

AFB	Air Force Base
AGE	Aerospace Ground Equipment
ANG	Air National Guard
ANGB	Air National Guard Base
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DLA	Defense Logistics Agency
DNR	Department of Natural Resources
DOD	Department of Defense
DPDO	Defense Property Disposal Office
DRMS	Defense Reutilization and Marketing Service
EPA	Environmental Protection Agency
^{o}F	Degrees Fahrenheit
FTS	Field Training Site
Gal/mo	Gallons per Month
Gal/yr	Gallons per Year
GPM	Gallons per Minute
HARM	Hazard Assessment Rating Methodology
HMTC	Hazardous Materials Technical Center
IRP	Installation Restoration Program
JP	Jet Petroleum
MOGAS	Motor Gasoline
MSL	Mean Sea Level
NDI	Nondestructive Inspection
No.	Number
PD	Petroleum Distillate
POL	Petroleum, Oils, and Lubricants
ppm	Parts per Million
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
TCE	Trichloroethylene
USAF	United States Air Force
WPA	Works Progress Administration
WW	World War

GLOSSARY OF TERMS

GLOSSARY OF TERMS

1. ALLUVIUM - A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its flood plain or delta.

2. AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

3. BIOME - An ecosystem of a large area in which the mature, stable (climax) communities are similar in appearance.

4. CONFINING STRATA - A strata of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

5. CONTAMINANT - As defined by section 104(a)(2) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will cause or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformation, in such organisms or their offspring.

6. DISCHARGE - The process involved in the draining or seepage of water out of a groundwater aquifer.

7. DOWNGRADIENT - A direction that is hydraulically downslope; the direction in which groundwater flows.

8. ECOSYSTEM - An ecological community forming a unit with the nonliving factors of its environment.

9. ECOTONE - A transition area between two adjacent ecological communities usually exhibiting competition between organisms common to both.

10. EVAPOTRANSPIRATION - Evaporation of water from the ground surface and transpiration through vegetation.

11. HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

    a. Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or

    b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

12. MIGRATION (Contaminant) - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

13. PD-680 - A petroleum distillate used as a safety cleaning solvent. Two types of PD-680 solvent have been used: Type I, having a flash point of 100°F; and Type II, having a flash point of 140°F.

14. PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

15. POTENTIOMETRIC SURFACE - An imaginary surface that is coincident with the elevation to which water from a pumped or nonpumped aquifer would rise in a well hydraulically connected to that aquifer.

16. STATIC WATER ELEVATION - The elevation to which water from a non-pumped aquifer would rise in a well hydraulically connected to that aquifer.

17. STRATA - Distinguishable horizontal layers separated vertically from other layers.

18. SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

19. UPGRADIENT - A direction that is hydraulically upslope.

20. WATER TABLE - The upper limit of the portion of the ground wholly saturated with water.

21. WETLAND - An area subject to permanent or prolonged inundation or saturation that exhibits plant communities adapted to this environment.

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REFERENCES

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6. National Oceanic and Atmospheric Administration, Local Climatological Data, Annual Summary With Comparative Data for Alpena, Michigan, 1983, National Climatic Data Center, Asheville, NC, 4 pp.

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APPENDICES

PERMANENT FIELD TRAINING SITE

MICHIGAN AIR NATIONAL GUARD
PHELPS COLLINS ANGB, ALPENA, MI 49707-8125

REPLY TO
ATTN OF: PFTS/DE 16 May 1986

SUBJECT: IRP

TO: Mr. Lee Householder
ANGSC/DEV
Building 3500, Stop 18
Andrews AFB, MD 20331-6008

Attached is IRP per telephone call.

GEORGE L. WEINHAGEN, Lt Col, MI ANG 2 Atchs
Base Civil Engineer 2 IRPs

APPENDIX A.

OUTSIDE AGENCY CONTACT LIST

OUTSIDE AGENCY CONTACT LIST

Michigan Department of Natural Resources
Groundwater Quality Division
Larry Thorton (District Groundwater Quality Supervisor)
Roscommon, Michigan (517) 275-5151

Michigan Department of Natural Resources
Groundwater Quality Division
Arthur Caden (Environmental Engineer)
Roscommon, Michigan (517) 275-5151

Michigan Department of Natural Resources
Groundwater Quality Division
Tyrone Black (Hydrogeologist)
Roscommon, Michigan (517) 275-5151

Michigan Department of Natural Resources
Water Management Division
Flood Hazard Management
Terry Longanbach
Lansing, Michigan (517) 373-3930

Michigan Department of Natural Resources
Soil Conservation Service
Neil Stroesenreuter
(Acting State Soil Scientist)
East Lansing, Michigan (517) 337-6680

Michigan Department of Natural Resources
Wildlife Management Division
Tom Carlson (Wildlife Biologist)
Atlanta, Michigan (517) 785-4251

Michigan Department of Public Health
Division of Water Supply
Dick Silver
Alpena, Michigan (517) 356-4507

Alpena County Road Commission
Ken Apsey
Alpena, Michigan (517) 354-3252

United States Geological Survey
Library
Reston, Virginia (703) 860-6673

Jesse Besser Meuseum
Matt Linky - Assistant Director
Alpena, Michigan (517) 356-2202

APPENDIX B.

RESUMES OF SEARCH TEAM MEMBERS

DONATO R. TELESCA

EDUCATION

B.S., Chemical Engineering, Massachusetts Institute of Technology
B.S., Business Administration, Major in Management, Rutgers University

EXPERIENCE

Mr. Telesca has 37 years of technical and managerial experience in process engineering, pollution control engineering, and solid waste and wastewater management. recent experience in Installation Restoration Program and remedial action for Army, Navy and Air Force. Developed quality assurance program for Corps of Engineers, Omaha. Directed health and safety studies in industry. Principal investigator in projects to identify and evaluate process design, alternative processing systems, characterize waste streams, product intermediates and uses, and disposal options.

Program manager for hazardous waste site cleanup projects involving ambient air monitoring, costing, locating buried drums, landfill excavation, well drilling, and groundwater monitoring; installation restoration program; removal of asbestos; redesign of industrial waste treatment plants; and identification of applicable federal, state and local regulations. Experienced in logistics of multitask projects requiring interdisciplinary field crews at nationwide sites.

EMPLOYMENT

<u>Dynamac Corporation (1977-Present</u>: Manager, Remedial Action and Treatment Department

Supervising ten professionals and supporting personnel in the department. Program manager and directly involved in:

- Phase I Installation Restoration Program, which included records search, interviews and hazardous waste onsite inspections at four Air National Guard, Air Force Bases.

- Development of design, specifications and cost estimates for remedial action for:

  - Removal of asbestos at 33 radar field sites
  - Removal of drums containing chlorinated solvents at NIROP, Fridley, Minnesota
  - Removal of drums containing DDT, Moody AFB
  - Removal of three contaminated tanks at Sacramento Army Depot
  - Removal of jet fuel from two Air Force Bases
  - Development of closure and post-closure plans for waste pile containing munitions and landfill containing hazardous waste (the latter including design specifications and cost estimates for the Phase IV remedial action plan).

- o Preparation of statement of work for Remedial Action Plan installation Restoration Program at 12 Air Force Bases.

- o Wrote the Quality Assurance Program for the Technical Representative of the Corps of Engineers, Omaha District, for NIROP.

- o Directed the study "Thermal Destruction of Low Level Hazardous Wastes in Navy Boilers and Incinerators" which consisted of four phases: Problem Definition, Assessment of State of Technology, Technology projections, and Alternatives and Capability Goals.

- o Program manager for a project to "identify and assess potential hazardous waste disposal sites at ten installations operated by the Federal Bureau of Prisons.

- o Manages multitask projects requiring interdisciplinary staff.

- o Manages crews doing onsite field studies for programs listed earlier.

- o Has directed teams making quick response (within 2 days) to emergency situations at locations in New Mexico, Oklahoma, Alaska and California.

- o Directed onsite industry studies to assess pollution control systems for reducing inorganic mercury in waste streams; also studied several industries to develop generic pollutant standards for industries using similar processes (unit processing studies); e.g., hydrocarbon chlorination.

- o Investigator on EPA hazardous waste listing program under RCRA.

- o Studied process redesign and engineering controls for several DOD fabrication and maintenance operations, including degreasing, electroplating, paint still bottoms and sludges.

- o Characterized wastewater industrial discharges in a study of 343 industries; chemical and physical data were used to establish pollutant impact, and the need for engineering controls, wastewater stabilization ponds, onsite treatment systems and land disposal systems.

<u>Electro-Nucleonics Laboratories, Inc. (1973-1977)</u>: Director of Manufacturing

Responsible for establishing protocols for production and adherence to quality control standards. Also assisted in establishing standards and techniques in radioimmunoassay diagnostic work.

Responsible for specifications, and purchase of instrumentation used in the manufacturing facilities. Was responsible for the disposal of regular biological and radioactive waste.

W. R. Grace and Company (1961-1973): Manager of Process Development

Evaluated regulatory compliance of W. R. Grace Nuclear Reprocessing plant in New York for hazardous waste disposal methods. Where such methods were unsatisfactory, designed improvements such as removal of contaminated filters in high radioactivity area; redesign of collection system for hazardous wastewater; design of procedures for burying the radioactive liquids and solid wastes received from outside the plant. Sampled New York State waters and took soil samples from surrounding farms to determine the extent of contamination by hazardous materials.

Designed new manufacturing procedures to reduce generation of hazardous waste from polycrystalline silica manufacturing. Designed, reviewed and implemented the procedures for disposal of hazardous wastes which included chlorinated hydrocarbon, hydrochloric acid, sodium hydroxide and by-products from the manufacturing process.

Evaluated existing procedures and recommended changes in the collection and disposal of hazardous solids and liquids, including heavy metals, acids, bases and organometals.

For Bechtel and Nuclear Fuel Services certified that construction of a nuclear reprocessing plant met all specifications for disposal of hazardous wastes, including radioactive uranium and daughter products, acids, bases and alcohols. Also assisted in the installation and operation of continuous sampling of plant streams discharging into state waters.

As plant manager of Nuclear Development Facility and Ceramic Facility, was responsible for process procedures and development of equipment. Also produced development quantities of nuclear fuels. Was responsible for collection of solid and liquid radioactive wastes, which were generated in the facility. Redesigned distillation system incorporating infrared detector instrumentation for control of distillation column.

As manager of Process Development, had technical and administrative responsibilities for four chemical engineers and ten technicians. Responsible for control of gaseous, solids, and water emissions from operating equipment. Worked with spray towers, cyclones, hydroclones, filters, spray dryers, etc.

As Staff Project Engineer of Division General Management Group, had technical and administrative responsibilities with regard to expansion projects.

As Production Manager of Chemicals Division, had management responsibilities for production, maintenance and engineering development, quality control and waste disposal for seven producing units. Some o the products produced were: rare earths and polishing compounds, raney nickel, silica gel, desiccant clay, sodium silicate, cracked catalysts and specialty catalysts.

As Project Manager of Water Processing Department, worked primarily on an M&O proposal for an Office of Saline Water contract. Assisted in development of anticorrosion studies for desalination equipment.

Grace Electronics Chemicals, Inc. (1960-1961): Vice President and General Manager; President, International Metalloids

General management responsibilities for overall operation of a silicon monocrystalline production, including P&L statements and direct manufacturing costs.

International Metalloids (1959-1960): Vice President and General Manager

Designed standard operating procedures for polycrystalline silicon production, including control technology for gaseous, liquid and waste emissions. Redesigned instrumentation for production of high-purity polycrystalling silicon at thermal cracking furnaces. Was directly responsible for adherence to Puerto Rican regulations regarding hazardous wastes.

Davison Chemicals Company (1954-1959): Chemical Engineer

Developed processes for catalysts, projecting them from scale to preproduction quantities. Redesigned instrument on process equipment at alumina plant to reduce loss of pentasol (5-carbon chain alcohol).

Was responsible for operation and maintenance of a recycle air system in the tabletting area of the plant. Was a member of the engineering team representing Grace at the Maryland Clean Water Committee meetings, where standard methods of sampling and control of liquid wastes were formulated.

Hercules Powder Company (1948-1954): Senior Chemical Engineer

Designed instrumentation and changes in plant processes to reduce contamination of waste streams. Process changes were developed to reduce pH, COD, BOD, solids, and total volume.

Invented a new production process and instituted new procedures required for the collection and proper disposal of chlorinated rubber and chlorinated off-grade product, carbon tetrachloride, rubber waste and hydrochloric acid waste.

Developed procedures for the collection and disposal of hazardous wastes resulting from the manufacture of pilot plant log sizes of sodium carboxymethyl cellulose, plasticizers and other organic based products.

Supervised the operations for disposal of hazardous waste materials from the nitric acid manufacturing unit, sulfuric acid concentrations, nitrocellulose manufacturing and packaging facilities, alcohol distillation unit and cellulose acetate manufacturing facilities.

MIT Chemical Warfare Development Laboratory; U.S. Naval Gun Factory; Marin Manufacturing and Supply Company (1940-1947): Senior Engineer and Draftsman

Made original layouts and designs on various mechanical equipment.

AFFILIATION

American Institute of Chemical Engineers

PUBLICATIONS AND PRESENTATIONS

Telesca, D.R., "The Adsorption of Ethylene-Ethane and Ethylene-Propylene on Activated Carbon." Massachusetts Institute of Technology, Chemical Engineering, 1948.

Telesca, D.R., J.M. Evans, and R.K. Tanita. "Process and Equipment Problems and Solutions in Coal Conversion Processes." Presented at ACS Symposium on Occupational Health Control in Fossil Energy Technologies. Washington, DC, September 10, 1979.

Evans, J.M., R.K. Tanita, and D.R. Telesca. "Comparative Practices in Worker Protection." Presented at ACS Symposium on Occupational Health Control in Fossil Energy Technologies, Washington, DC, September 10, 1979.

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TORSTEN ROTHMAN

Senior Environmental Engineer

EDUCATION

M.S. , Environmental Health Engineering, University of Texas
B.Ch.E., Rensselaer Polytechnic Institute

EXPERIENCE

Mr. Rothman has 26 years of experience in all aspects of environmental health engineering, hazardous wastes and solid wastes management, environmental impact analysis, wastewater treatment, and air pollution evaluation and control. This includes 20 years as an Air Force bioenvironmental engineer with service at base level, major command, research and consulting laboratories, and USAF headquarters. He has in-depth knowledge and understanding of Air Force operations, organization, and occupational safety and health programs.

Mr. Rothman managed the implementation of the National Environmental Policy Act for the U.S. Air Force, and directed and managed the preparation and filing of over 15 Environmental Impact Statements. The subjects of these impact statements covered a broad spectrum of biophysical and socioeconomic issues. Mr. Rothman was responsible for technical adequacy, accuracy and completeness, as well as for procedural compliance of all documents. He also served on the staff of the Air Force Surgeon General as an advisor on all aspects of environmental health engineering, and directed the development of Air Force policy for compliance with Federal regulations in areas of wastewater, solid waste, air pollution, and drinking water.

Mr. Rothman's bioenvironmental engineering experience includes the provision of a full range of occupational and environmental health services to various Air Force installations. These services include conducting numerous industrial hygiene, medical and industrial ionizing radiation, wastewater, and environmental protection studies; and membership in a Disaster Response Force responsible for medical surveillance of nuclear, biological and chemical decontamination procedures, and personnel protection and monitoring.

Mr. Rothman's municipal wastewater experience includes in-depth studies on trickling filter and activated sludge municipal wastewater treatment plants. Most of these studies were performed while he was a consultant to the Pacific-area Air Force Installations regarding all aspects of environmental health engineering. Related studies include research on solid waste management practices, and combustion products of plastics commonly found in municipal refuse.

Presently Mr. Rothman serves as Director of the Hazardous Materials Technical Center, a center of expertise for information on all aspects of hazardous materials/hazardous wastes management, including safety and health, transportation, storage, handling, and disposal. The types of projects that Mr. Rothman routinely manages include those involved with environmental engineering, hazardous waste management, sanitary engineering and waste treatment.

CERTIFICATION

Diplomate, American Academy of Environmental Engineers
Professional Engineer (Environmental Health), Texas

HONORS

Sigma Xi, Research Society of America
Chi Epsilon, Civil Engineering Honorary Society
Phi Kappa Phi, Scholastic Honorary Society
Registry of International Consultants, American Public Health Association
Member Emeritus of American Conference of Governmental Industrial Hygienists

WILLIAM EATON

Hydrogeologist

EDUCATION

M.S., Environmental Sciences, University of Virginia
B.A., Geology, Susquehanna University

EXPERIENCE

Mr. Eaton's primary experience is in the areas of geologic and groundwater investigation of sites that were contaminated by hazardous or toxic organic and inorganic chemical substances. These investigations have included emergency response to ruptured surface petroleum storage tanks and subsurface pipelines. In such instances, Mr. Eaton directed onsite remedial actions including the proper location and installation of subsurface containment barriers, and nested piezometers designed to sample various confined aquifers. Similar studies involved the investigation of hazardous waste dump sites, and the development of contract design specifications for excavation of the buried waste and sealing of the contaminated area.

Investigation of nonpoint sources of chemical contamination have also been conducted by Mr. Eaton. Typically, these studies have involved implementation of a regional scale physical and chemical groundwater monitoring scheme, and subsequent analysis of the data to pinpoint the probable sources of contamination and contaminant migration direction and rates. Where applicable, consultations were held with the interested parties in order to advise them of alternatives for minimizing the impact of the contamination.

Mr. Eaton has been the primary investigator and author of several reports dealing with the development of groundwater resources for municipal, industrial, and domestic purposes. These studies included the design and analysis of pump-test data to determine the hydrogeologic characteristics of the tested aquifers. Such investigations have been performed in bedrock aquifers and unconsolidated, confined and unconfined aquifers.

HONORS

Sigma Xi, Research Society of America

TIMOTHY N. GARDNER

Environmental Scientist

EDUCATION

M.A., Environmental Biology, Hood College, 1984
B.S., Forestry/Resource Management, West Virginia University, 1978

EXPERIENCE

Mr. Gardner has four years of technical experience in environmental control and research, with emphasis on chemical safety, radiation safety, hazardous waste management (chemical and radiologic), risk assessment, and activated carbon filtration research. Mr. Gardner's past responsibilities included chemical and radioactive waste pickup and storage for disposal at a large cancer research facility, and for chemical and radioactive spill control, as well as safety surveys, and technical assistance in activated carbon desorption research.

EMPLOYMENT

Dynamac Corporation (1984-Present): Staff Scientist

At Dynamac, Mr. Gardner's responsibilities include site surveys and records searches for Phase I portion of Installation Restoration Program (IRP) for various Air National Guard Bases. Efforts include risk assessment, site prioritization, and remedial action recommendations. Past experience at Dynamac includes working on a report for the update and revision of a DLA regulation for "Disposal of Unwanted Radioactive Material." The revision coordinated the needs and requirements of the DLA, AAMCCOM, and all other affected agencies and services.

NCI-Frederick Cancer Research Facility (1981-1984): Lab Technician

Mr. Gardner worked in both the radiation and chemical safety divisions. His responsibilities included monitoring personal and environmental air quality at work areas where free iodinations occur, monitoring work areas and equipment for isotope contamination, periodic surveys to monitor compliance with NRC safety regulations, isotope inventory control, transfer of isotopes between licenses, and periodic calibration and maintenance of survey instruments. Mr. Gardner was also responsible for radioactive and chemical waste pickup and storage for disposal and, as advisory personnel, for safety-related matters pertinent to radiation and radioactive waste, as well as chemical safety.

PROFESSIONAL AFFILIATIONS

American Tree Farm Association
Hardwood Research Council
West Virginia Forestry Association

APPENDIX C.

LIST OF INTERVIEWEE IDENTIFICATION NUMBERS

LIST OF INTERVIEWEE IDENTIFICATION NUMBERS

INTERVIEWEE NUMBER	PRIMARY DUTY ASSIGNMENT	YEARS ASSOCIATED WITH PHELPS COLLINS ANGB
1	Base Civil Engineer	4
2	Supply/Munitions	27
3	Contracting	30
4	Fire Chief	15
5	Supply Chief	25
6	Medical Technician	4
7	Electrician	20
8	Electrician	17
9	Base Photographer/Transportation	18
10	Water/Sewerage Operator	13
11	POL Manager	8
12	County Airport Manager	25
13	Motor Pool Manager	32
14	Graphic Artist	28
15	Grounds/Road Maintenance	19

APPENDIX D.

USAF HAZARD ASSESSMENT RATING METHODOLOGY

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United Sates Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from the USAF Occupational and Environmental Health Laboratory (OEHL), the Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it had been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, the potential pathways for contamination migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface-water migration, flooding, and groundwater migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts tor educe the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites at which there is no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to installation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	____	____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ____
2. Confidence level (C - confirmed, S - suspected) ____
3. Hazard rating (H - high, M - medium, L - low) ____

Factor Subscore A (from 20 to 100 based on factor score matrix) ____

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 X factor score/3) ______

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ☐

Table 1
HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

1. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

Table 1--Continued

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)	S = Suspected confidence level
o Verbal reports from interviewer (at least 2) or written information from the records	o No verbal reports or conflicting verbal reports and no written information from the records
o Knowledge of types and quantities of wastes generated by shops and other areas on base	o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

Table 1--Continued

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($>10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8
(Thunderstorms)	0-5 0	6-35 30	36-49 60	>50 100	

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to + 20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8

Table 1--Continued

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

GNR122

GNR142

APPENDIX E.

SITE RATING FORMS

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 1 - P.O.L. Area

LOCATION Phelps Collins ANGB, 150 yards west of Building No. 1

DATE OF OPERATION OR OCCURRENCE May 1983

OWNER/OPERATOR Phelps Collins ANGB P.O.L. operations

COMMENTS/DESCRIPTION

SITE RATED BY Hazardous Materials Technical Center

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
		Subtotals	117	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 65

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			54	114

Subscore (100 X factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 47

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	65
Waste Characteristics	60
Pathways	47
Total 172 divided by 3 =	57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x 0.95 = $\boxed{54}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 2 - Motor Pool Area

LOCATION Phelps Collins ANGB, 100 yds north of Building No. 4

DATE OF OPERATION OR OCCURRENCE Late 1940's - present

OWNER/OPERATOR Phelps Collins ANGB

COMMENTS/DESCRIPTION Site includes buildings No. 7 & 13, Paved area inbetween and drain ditch

SITE RATED BY Hazardous Materials Technical Center

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
		Subtotals	121	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 67

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	3	8	24	24
Subtotals			78	114

Subscore (100 X factor score subtotal/maximum score subtotal) 68

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 68

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	67
Waste Characteristics	80
Pathways	68

Total 215 divided by 3 = 72 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

72 x 0.95 = $\boxed{68}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 3 - Former Site of County Maintenance Garage

LOCATION Phelps Collins ANGB, 100 yards east of motor pool area

DATE OF OPERATION OR OCCURRENCE Late 1940's through 1965

OWNER/OPERATOR Alpena County

COMMENTS/DESCRIPTION . Facility has been demolished

SITE RATED BY Hazardous Materials Technical Center

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
		Subtotals	114	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 63

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C - confirmed, S - suspected) S
3. Hazard rating (H - high, M - medium, L - low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	38	108

Subscore (100 X factor score subtotal/maximum score subtotal) 35

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
		Subtotals	54	114

Subscore (100 X factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 47

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	63
Waste Characteristics	40
Pathways	47

Total 150 divided by 3 = 50 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

50 x 0.95 = 48

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 4 - 3rd Fire Department Training Area

LOCATION Phelps Collins ANGB, 500 yards east of Site No. 7

DATE OF OPERATION OR OCCURRENCE 1973-1984

OWNER/OPERATOR Phelps Collins ANGB Fire Department

COMMENTS/DESCRIPTION No longer in use

SITE RATED BY Hazardous Materials Technical Center

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
		Subtotals	107	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 59

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	70	114

Subscore (100 X factor score subtotal/maximum score subtotal) 61

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 59
Waste Characteristics 100
Pathways 61
Total 220 divided by 3 = 73 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

73 x 0.95 = $\boxed{70}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 5 - 2nd Fire Department Training Area

LOCATION Phelps Collins ANGB, South-central portion of "kitchen" dump

DATE OF OPERATION OR OCCURRENCE 1965-1973

OWNER/OPERATOR Phelps Collins ANGB Fire Department

COMMENTS/DESCRIPTION

SITE RATED BY Hazardous Materials Technical Center

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
		Subtotals	103	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
		Subtotals	54	114

Subscore (100 X factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	100
Pathways	50
Total 207 divided by 3 =	69 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

69 x 1.0 = $\boxed{69}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 6 - Former Solid Waste Landfill

LOCATION Phelps Collins ANGB, 200 yards north of sewerage treatment plant

DATE OF OPERATION OR OCCURRENCE 1952-1965

OWNER/OPERATOR Phelps Collins ANGB

COMMENTS/DESCRIPTION

SITE RATED BY Hazardous Materials Technical Center

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
		Subtotals	117	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 65

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	4	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	3	8	24	24
		Subtotals	78	114

Subscore (100 X factor score subtotal/maximum score subtotal) 68

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 68

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	65
Waste Characteristics	100
Pathways	68
Total 233 divided by 3 =	78 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

78 x 1.0 = $\boxed{78}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 7 - 1st Fire Department Training Area

LOCATION Phelps Collins ANGB, east edge of Site No. 6

DATE OF OPERATION OR OCCURRENCE 1952-1965

OWNER/OPERATOR Phelps Collins ANGB Fire Department

COMMENTS/DESCRIPTION

SITE RATED BY Hazardous Materials Technical Center

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
		Subtotals	117	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 65

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			54	114

Subscore (100 X factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	65
Waste Characteristics	100
Pathways	50
Total 215 divided by 3 =	72 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

72 X 1.0 = $\boxed{72}$

APPENDIX F.

INVENTORY OF POL STORAGE TANKS

INVENTORY OF POL STORAGE TANKS

Fuel	Location	Tank Capacity (Gal)	Number, Type of Tanks
Fuel Oil	Bldg. 1	2,000	1 underground
Fuel Oil	Bldg. 2	4,000	1 underground
Fuel Oil	Bldg. 7	4,000	1 underground
Fuel Oil	Bldg. 10	1,000	1 underground
Fuel Oil	Bldg. 26	1,500	1 underground
Fuel Oil	Bldg. 28	1,500	1 underground
Fuel Oil	Bldg. 40	1,000	1 aboveground
Fuel Oil	Bldg. 45	1,000	1 underground
Fuel Oil	Bldg. 46	275	1 underground
Fuel Oil	Bldg. 320	1,500	1 underground
Fuel Oil	Bldg. 333	10,000	1 underground
Fuel Oil	Bldg. 403	1,500	1 underground
Fuel Oil	Bldgs. 405 & 406	1,500	1 underground
Fuel Oil	Bldg. 412	1,500	1 underground
Fuel Oil	Bldg. 413	1,500	1 underground
Fuel Oil	Bldg. 416	1,500	1 underground
Fuel Oil	Bldg. 417	1,500	1 underground
Fuel Oil	Bldg. 502	1,000	1 underground
Fuel Oil	Bldg. 504	1,500	1 underground
Fuel Oil	Bldg. 506	1,500	1 underground
Fuel Oil	Bldg. 601	4,000	1 underground
Fuel Oil	Bldg. 606	4,000 & 280	2 underground
Fuel Oil	Bldg.4014	275	2 aboveground
Fuel Oil	Bldg. 5	275	2 aboveground
Fuel Oil	Bldg. 6	275	2 aboveground
Fuel Oil	Bldg. 11	275	1 aboveground
Fuel Oil	Bldg. 23	275	1 aboveground
Fuel Oil	Bldg. 24	275	1 aboveground
Fuel Oil	Bldg. 25	275	2 aboveground
Fuel Oil	Bldg. 112	275	2 aboveground
Fuel Oil	Bldg. 113	275	2 aboveground
Fuel Oil	Bldg. 114	275	2 aboveground
Fuel Oil	Bldg. 115	275	2 aboveground
Fuel Oil	Bldg. 117	275	1 aboveground
Fuel Oil	Bldg. 121	275	1 aboveground
Fuel Oil	Bldg. 123	275	1 aboveground
Fuel Oil	Bldg. 201	275	2 aboveground
Fuel Oil	Bldg. 202	275	2 aboveground
Fuel Oil	Bldg. 203	275	2 aboveground

INVENTORY OF POL STORAGE TANKS

(Continued)

Fuel	Location	Tank Capacity (Gal)	Number, Type of Tanks
Fuel Oil	Bldg. 20[illegible]	275	2 aboveground
Fuel Oil	Bldg. 205	275	2 aboveground
Fuel Oil	Bldg. 208	275	2 aboveground
Fuel Oil	Bldg. 209	275	2 aboveground
Fuel Oil	Bldg. 210	275	2 aboveground
Fuel Oil	Bldg. 211	275	2 aboveground
Fuel Oil	Bldg. 213	275	2 aboveground
Fuel Oil	Bldg. 215	275	2 aboveground
Fuel Oil	Bldg. 218	275	2 aboveground
Fuel Oil	Bldg. 301	275	1 aboveground
Fuel Oil	Bldg. 302	275	1 aboveground
Fuel Oil	Bldg. 303	275	1 aboveground
Fuel Oil	Bldg. 305	275	1 aboveground
Fuel Oil	Bldg. 306	275	2 aboveground
Fuel Oil	Bldg. 309	275	2 aboveground
Fuel Oil	Bldg. 310	275	2 aboveground
Fuel Oil	Bldg. 311	275	2 aboveground
Fuel Oil	Bldg. 312	275	2 aboveground
Fuel Oil	Bldg. 313	275	2 aboveground
Fuel Oil	Bldg. 316	275	2 aboveground
Fuel Oil	Bldg. 317	275	2 aboveground
Fuel Oil	Bldg. 318	275	2 aboveground
Fuel Oil	Bldg. 322	275	2 aboveground
Fuel Oil	Bldg. 323	275	2 aboveground
Fuel Oil	Bldg. 324	275	2 aboveground
Fuel Oil	Bldg. 326	275	2 aboveground
Fuel Oil	Bldg. 327	275	2 aboveground
Fuel Oil	Bldg. 328	275	2 aboveground
Fuel Oil	Bldg. 329	275	2 aboveground
Fuel Oil	Bldg. 334	275	2 aboveground
Fuel Oil	Bldg. 335	275	1 aboveground
Fuel Oil	Bldg. 407	275	2 aboveground
Fuel Oil	Bldg. 409	275	3 aboveground
Fuel Oil	Bldg. 414	275	1 aboveground
Fuel Oil	Bldg. 600	275	2 aboveground
Fuel Oil	Bldg. 601	275	1 aboveground
Fuel Oil	Bldg. 2004	275	1 aboveground
Fuel Oil	Bldg. 2010	275	2 aboveground
Fuel Oil	Bldg. 4012	275	1 aboveground
Fuel Oil	Bldg. 4020	275	2 aboveground

INVENTORY OF POL STORAGE TANKS

(Continued)

Fuel	Location	Tank Capacity (Gal)	Number, Type of Tanks
Fuel Oil	Bldg. 20	10,000	1 aboveground
Fuel Oil	Bldg. 18	2,000	1 underground
MOGAS	Bldg. 18	5,000	2 underground
MOGAS	Bldg. 417	1,000	1 underground
JP-4	Bldg. 21	10,000	1 aboveground
JP-4	Bldg. 7024	1,000	1 aboveground
JP-4	Bldg. 7032	424,000	2 aboveground
JP-4	Bldg. 7049	5,000	1 aboveground

APPENDIX G.

WELL TEST RESULTS

APPENDIX G

Part A

OEHL

- EPA 601 (Volatile Halocarbons)

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 2 July 83

TO:

FROM: USAF OEHL/SA
BROOKS AFB TX 78235

SAMPLE IDENTITY: W TER

DATE RECEIVED: 6 July 83

SAMPLE FROM:

LAB CONTROL NR: See Below

TEST FOR: latile Halocarbons

Methodology: EPA Method 601	Bldg 601	Well 1	Well 2	Well 3	Well 4	
HL NO:	34680	34688	34695	34702	34709	DET.
SE NO:	GP830126	GP830131	GP830136	GP830141	GP830146	LIMIT
romodichloromethane	0.9	ND	ND	ND	ND	0.1
romoform	2.0	ND	ND	ND	ND	0.2
romomethane	ND	ND	ND	ND	ND	1.0
Carbon Tetrachloride	ND	ND	ND	Trace<0.3	ND	0.1
Chlorobenzene	ND	ND	ND	ND	ND	0.2
hloroethane	ND	ND	ND	ND	ND	0.5
-Chloroethylvinyl ether	ND	ND	ND	ND	ND	0.1
Chloroform	0.6	ND	ND	ND	ND	0.1
hloromethane	ND	ND	ND	ND	ND	0.1
ibromochloromethane	2.3	ND	ND	ND	ND	0.1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
,3-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
,4-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
Dichlorodifluoromethane	ND	ND	ND	ND	ND	0.1
,1-Dichloroethane	ND	ND	ND	ND	ND	0.2
,2-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,1-Dichloroethene	ND	ND	ND	ND	ND	0.1
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	0.1
,2-Dichloropropane	ND	ND	ND	ND	ND	0.1
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
ethylene Chloride	Trace<0.3	ND	ND	Trace<0.3	ND	0.2
,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	0.1
Tetrachloroethylene	ND	ND	ND	ND	ND	0.1
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	0.1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	0.1
Trichloroethylene	4.3	ND	ND	6.5	ND	0.1
Trichlorofluoromethane	ND	ND	ND	ND	ND	0.1
Vinyl Chloride	ND	ND	ND	ND	ND	0.2

Results in Micrograms per Liter

LEOPOLDO L. RODRIGUEZ, Chemist
Trace Organics Analysis Function
Environmental Chemistry Branch

ADRIAN SANCHEZ, GS-11
Trace Organics Analysis Function
Environmental Chemistry Branch

REQUESTING AGENCY (Mailing Address)

USAF Hospital/SGPB
Wurtsmith AFB MI 48753

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

Atch 2

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE: 2 July 83

TO:

FROM: USAF OEHL/SA
BROOKS AFB TX 78235

SAMPLE IDENTITY: WATER

DATE RECEIVED: 6 July 83

SAMPLE FROM:

LAB CONTROL NR: See Below

TEST FOR: Volatile Halocarbons

Methodology: EPA Method 601 Well 5

OEHL NO:	34716					DET. LIMIT
BASE NO:	GP830151					
Bromodichloromethane	ND					0.1
Bromoform	ND					0.2
Bromomethane	ND					1.0
Carbon Tetrachloride	ND					0.1
Chlorobenzene	ND					0.2
Chloroethane	ND					0.5
2-Chloroethylvinyl ether	ND					0.1
Chloroform	ND					0.1
Chloromethane	ND					0.1
Dibromochloromethane	ND					0.1
1,2-Dichlorobenzene	ND					0.2
1,3-Dichlorobenzene	ND					0.2
1,4-Dichlorobenzene	ND					0.2
Dichlorodifluoromethane	ND					0.1
1,1-Dichloroethane	ND					0.2
1,2-Dichloroethane	ND					0.2
1,1-Dichloroethene	ND					0.1
trans-1,2-Dichloroethene	ND					0.1
1,2-Dichloropropane	ND					0.1
cis-1,3-Dichloropropene	ND					0.2
trans-1,3-Dichloropropene	ND					0.2
Methylene Chloride	ND					0.2
1,1,2,2-Tetrachloroethane	ND					0.1
Tetrachloroethylene	ND					0.1
1,1,1-Trichloroethane	ND					0.1
1,1,2-Trichloroethane	ND					0.1
Trichloroethylene	ND					0.1
Trichlorofluoromethane	ND					0.1
Vinyl Chloride	ND					0.2

Results in Micrograms per Liter

LEOPOLDO L. RODRIGUEZ, Chemist
Trace Organics Analysis Function
Environmental Chemistry Branch

ADRIAN SANCHEZ, GS-11
Trace Organics Analysis Function
Environmental Chemistry Branch

REQUESTING AGENCY *(Mailing Address)*

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 5 Sep 84

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235

SAMPLE IDENTITY: WATER

DATE RECEIVED: 7 Aug 84

SAMPLE FROM:

LAB CONTROL NR:

TEST FOR: VOLATILE HALOCARBONS

METHODOLOGY: EPA METHOD 601

	WELL # 1	2	3	4	5	
OEHL #	43795	43797	43799	43801	43803	DET.
BASE #	GP840034	GP840035	GP840036	GP840037	GP840038	LIMIT
Bromodichloromethane	ND	ND	ND	ND	ND	0.1
Bromoform						0.2
Bromomethane						1.0
Carbon Tetrachloride						0.1
Chlorobenzene						0.2
Chloroethane						0.5
2-Chloroethylvinyl ether			ND	ND		0.1
Chloroform			0.2	0.3		0.1
Chloromethane			ND	ND		0.1
Dibromochloromethane						0.1
1,2-Dichlorobenzene						0.2
1,3-Dichlorobenzene						0.2
1,4-Dichlorobenzene						0.2
Dichlorodifluoromethane						0.1
1,1-Dichloroethane						0.2
1,2-Dichloroethane						0.2
1,1-Dichloroethene						0.1
trans-1,2-Dichloroethene						0.1
1,2-Dichloropropane						0.1
cis-1,3-Dichloropropene						0.2
trans-1,3-Dichloropropene						0.2
Methylene Chloride						0.2
1,1,2,2-Tetrachloroethane						0.1
Tetrachloroethylene						0.1
1,1,1-Trichloroethane						0.1
1,1,2-Trichloroethane			ND			0.1
Trichloroethylene			10.3			0.1
Trichlorofluoromethane			ND			0.1
Vinyl Chloride	ND	ND	ND	ND	ND	0.2

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

REQUESTING AGENCY (Mailing Address)

MSgt David Penn
Phelps Collins ANGB
Alpena MI 49707

EDWARD J. BROWN, Captain, USAF, BSC
Chief, Volatile Organics Section

ADRIAN SANCHEZ
Technician, Trace Organics Section

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE: 5 Sep 84

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235

SAMPLE IDENTITY: WATER

DATE RECEIVED: 7 Aug 84

SAMPLE FROM:

LAB CONTROL NR:

TEST FOR: VOLATILE HALOCARBONS

METHODOLOGY: EPA METHOD 601 WELL #6
OEHL # 43804
BASE # GP840039

		DET. LIMIT
Bromodichloromethane	ND	0.1
Bromoform		0.2
Bromomethane		1.0
Carbon Tetrachloride		0.1
Chlorobenzene		0.2
Chloroethane		0.5
2-Chloroethylvinyl ether		0.1
Chloroform		0.1
Chloromethane		0.1
Dibromochloromethane		0.1
1,2-Dichlorobenzene		0.2
1,3-Dichlorobenzene		0.2
1,4-Dichlorobenzene		0.2
Dichlorodifluoromethane		0.1
1,1-Dichloroethane		0.2
1,2-Dichloroethane		0.2
1,1-Dichloroethene		0.1
trans-1,2-Dichloroethene		0.1
1,2-Dichloropropane		0.1
cis-1,3-Dichloropropene		0.2
trans-1,3-Dichloropropene		0.2
Methylene Chloride		0.2
1,1,2,2-Tetrachloroethane		0.1
Tetrachloroethylene		0.1
1,1,1-Trichloroethane		0.1
1,1,2-Trichloroethane	ND	0.1
Trichloroethylene	0.2	0.1
Trichlorofluoromethane	ND	0.1
Vinyl Chloride	ND	0.2

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

EDWARD J. BROWN, Captain, USAF, BSC
Chief, Volatile Organics Section

ADRIAN SANCHEZ
Technician, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

MSgt David Penn
Phelps Collins ANGB
Alpena MI 49707

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE
5 Sept 84

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235

SAMPLE IDENTITY
WATER

DATE RECEIVED
15 Aug 84

SAMPLE FROM

LAB CONTROL NR

TEST FOR
Volatile Halocarbons

Methodology: EPA Method 601

OEHL NO:	45530 WELL	DET.
BASE NO:	GP840047 # 4	LIMIT
Bromodichloromethane	ND	0.1
Bromoform		0.2
Bromomethane		1.0
Carbon Tetrachloride		0.1
Chlorobenzene		0.2
Chloroethane		0.5
2-Chloroethylvinyl ether	ND	0.1
Chloroform	0.2	0.1
Chloromethane	ND	0.1
Dibromochloromethane		0.1
1,2-Dichlorobenzene		0.2
1,3-Dichlorobenzene		0.2
1,4-Dichlorobenzene		0.2
Dichlorodifluoromethane		0.1
1,1-Dichloroethane		0.2
1,2-Dichloroethane		0.2
1,1-Dichloroethene		0.1
trans-1,3-Dichloroethene		0.1
1,2-Dichloropropane		0.1
cis-1,3-Dichloropropene		0.2
trans-1,3-Dichloropropene		0.2
Methylene Chloride		0.2
1,1,2,2-Tetrachloroethane		0.1
Tetrachloroethylene		0.1
1,1,1-Trichloroethane		0.1
1,1,2-Trichloroethane	ND	0.1
Trichloroethylene	TRACE <0.2	0.1
Trichlorofluoromethane	ND	0.1
Vinyl Chloride	ND	0.2

Results in Micrograms per Liter

EDWARD J. BROWN, Captain, USAF, BSC
Chief, Volatile Organics Section

ADRIAN SANCHEZ
Technican, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

MSgt DAVID PENN
PHELPS COLLINS ANGB
ALPENA MI 49707

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.
TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 4 OCT 1984

FROM: USAF OEHL/SA
BROOKS AFB TX 78235

SAMPLE IDENTITY: WATER

DATE RECEIVED: 6 Sept 84

SAMPLE FROM: Phelps Collins

LAB CONTROL NR: 49686,88

TEST FOR: Volatile Halocarbons

Methodology: EPA Method 601 well / BLDG 28

OEHL NO:	49686	49688				DET.
BASE NO:	6P840053	6P840054				LIMIT
Bromodichloromethane	ND	ND				0.1
Bromoform						0.2
Bromomethane						1.0
Carbon Tetrachloride						0.1
Chlorobenzene						0.2
Chloroethane						0.5
2-Chloroethylvinyl ether						0.1
Chloroform						0.1
Chloromethane						0.1
Dibromochloromethane						0.1
1,2-Dichlorobenzene						0.2
1,3-Dichlorobenzene						0.2
1,4-Dichlorobenzene						0.2
Dichlorodifluoromethane						0.1
1,1-Dichloroethane						0.2
1,2-Dichloroethane						0.2
1,1-Dichloroethene						0.1
trans-1,2-Dichloroethene						0.1
1,2-Dichloropropane						0.1
cis-1,3-Dichloropropene						0.2
trans-1,3-Dichloropropene						0.2
Methylene Chloride						0.2
1,1,2,2-Tetrachloroethane						0.1
Tetrachloroethylene						0.1
1,1,1-Trichloroethane						0.1
1,1,2-Trichloroethane						0.1
Trichloroethylene						0.1
Trichlorofluoromethane						0.1
Vinyl Chloride						0.2

Results in Micrograms per Liter

Edward J. Brown

REQUESTING AGENCY (Mailing Address)

ANGSC/SGB
ANDREWS AFB, MD
20331-5000

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

A L Willis
TECHNICIAN

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 5 OCT 1984

FROM: USAF OEHL/SA
BROOKS AFB TX 78235

SAMPLE IDENTITY: WATER

DATE RECEIVED: 7 Sept 84

SAMPLE FROM: PHELPS-COLLINS

LAB CONTROL NR: 50035, 37, 39, 41

TEST FOR: Volatile Halocarbons

Methodology: EPA Method 601

	SINK	WELL 7	BLDG 28	WELL 3		
IDENT NO:	50035	50037	50039	50041		DET. LIMIT
BASE NO:	GN840055	GP840056	GP840057	GA840058		
Bromodichloromethane	ND	ND	10.2	2.3		0.1
Bromoform			9.5	1.1		0.2
Bromomethane			ND	ND		1.0
Carbon Tetrachloride			TR			0.1
Chlorobenzene			ND			0.2
Chloroethane						0.5
2-Chloroethylvinyl ether						0.1
Chloroform			7.0	5.0		0.1
Chloromethane			ND	ND		0.1
Dibromochloromethane			12.5	3.1		0.1
1,2-Dichlorobenzene			ND	ND		0.2
1,3-Dichlorobenzene						0.2
1,4-Dichlorobenzene						0.2
Dichlorodifluoromethane						0.1
1,1-Dichloroethane						0.2
1,2-Dichloroethane						0.2
1,1-Dichloroethene						0.1
trans-1,2-Dichloroethene						0.1
1,2-Dichloropropane						0.1
cis-1,3-Dichloropropene						0.2
trans-1,3-Dichloropropene						0.2
Methylene Chloride			TR			0.2
1,1,2,2-Tetrachloroethane			ND			0.1
Tetrachloroethylene			TR			0.1
1,1,1-Trichloroethane			ND			0.1
1,1,2-Trichloroethane			ND			0.1
Trichloroethylene			9.1	8.5		0.1
Trichlorofluoromethane			ND	ND		0.1
Vinyl Chloride			ND	ND		0.2

Results in Micrograms per Liter

Edward J. Brown
Maj, USAF

11 OCT 1984

REQUESTING AGENCY (Mailing Address)
ANGSC/SGB
ANDREWS AFB, MD
20331-5000

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

A. J. Killis
Technician

11

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 5 OCT 1984

TO:

FROM: USAF OEHL/SA
BROOKS AFB TX 78235

SAMPLE IDENTITY: WATER

DATE RECEIVED: 10 Sept 84

SAMPLE FROM: Phelps-Collins

LAB CONTROL NR: 50425,27,30

TEST FOR: Volatile Halocarbons

Methodology: EPA Method 601 well 1 BLD 28 well 2

OEHL NO:	50425	50427	50430			DET.
BASE NO:	6P840059	6P840060	6P840061			LIMIT
Bromodichloromethane	ND	15.1	ND			0.1
Bromoform		8.6				0.2
Bromomethane		ND				1.0
Carbon Tetrachloride	—					0.1
Chlorobenzene						0.2
Chloroethane						0.5
2-Chloroethylvinyl ether						0.1
Chloroform		8.4				0.1
Chloromethane		ND				0.1
Dibromochloromethane		20.9				0.1
1,2-Dichlorobenzene		ND				0.2
1,3-Dichlorobenzene						0.2
1,4-Dichlorobenzene						0.2
Dichlorodifluoromethane						0.1
1,1-Dichloroethane						0.2
1,2-Dichloroethane						0.2
1,1-Dichloroethene						0.1
trans-1,2-Dichloroethene						0.1
1,2-Dichloropropane						0.1
cis-1,3-Dichloropropene						0.2
trans-1,3-Dichloropropene						0.2
Methylene Chloride						0.2
1,1,2,2-Tetrachloroethane						0.1
Tetrachloroethylene						0.1
1,1,1-Trichloroethane						0.1
1,1,2-Trichloroethane						0.1
Trichloroethylene		8.4				0.1
Trichlorofluoromethane		ND				0.1
Vinyl Chloride		ND				0.2

Results in Micrograms per Liter

Edward J. Brown 11 OCT
Maj, USAF

REQUESTING AGENCY (Mailing Address)

ANGSC/SGB
ANDREWS AFB, MD
20331-5000

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

A L Willis
Technician

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 5 OCT 1984

FROM: USAF OEHL/SA
BROOKS AFB TX 78235

SAMPLE IDENTITY: WATER

DATE RECEIVED: 13 Sept 84

SAMPLE FROM: PHELPS COLLINS ANGB

LAB CONTROL NR: 51737,40,42

TEST FOR: Volatile Halocarbons

Methodology: EPA Method 601

	WELL 1	WELL 3	EFFLUENT-SEWAGE BLDG 45			
OEHL NO:	51737	51740	51742			DET.
BASE NO:	GP840069	GP840071	GP840072			LIMIT
Bromodichloromethane	ND	ND	4.7			0.1
Bromoform			1.3			0.2
Bromomethane			ND			1.0
Carbon Tetrachloride						0.1
Chlorobenzene						0.2
Chloroethane						0.5
2-Chloroethylvinyl ether						0.1
Chloroform			2.8			0.1
Chloromethane			ND			0.1
Dibromochloromethane			3.2			0.1
1,2-Dichlorobenzene			ND			0.2
1,3-Dichlorobenzene						0.2
1,4-Dichlorobenzene						0.2
Dichlorodifluoromethane						0.1
1,1-Dichloroethane						0.2
1,2-Dichloroethane						0.2
1,1-Dichloroethene						0.1
trans-1,2-Dichloroethene						0.1
1,2-Dichloropropane						0.1
cis-1,3-Dichloropropene						0.2
trans-1,3-Dichloropropene						0.2
Methylene Chloride						0.2
1,1,2,2-Tetrachloroethane						0.1
Tetrachloroethylene						0.1
1,1,1-Trichloroethane						0.1
1,1,2-Trichloroethane						0.1
Trichloroethylene			TR			0.1
Trichlorofluoromethane			ND			0.1
Vinyl Chloride			ND			0.2

Results in Micrograms per Liter

Edward J. Brown
Maj, USAF

11 OCT 1984

REQUESTING AGENCY (Mailing Address)

ANGSC/SGB
ANDREWS AFB, MD
20331-5000

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

A L Willis
TECHNICIAN

APPENDIX G

Part B

OEHL

- EPA 602 (Volatile Aromatics)

CM - 4

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE: 21 July 83

TO:

FROM: ~~USAF OEHL/SA~~ Brooks AFB TX 78235

SAMPLE IDENTITY: Water

DATE RECEIVED: 6 July 83

SAMPLE FROM:

LAB CONTROL NR: See Below

TEST FOR: Volatile Aromatics

Methodology: EPA 602

	P/C	P/C	P/C	P/C	P/C
OEHL No.	34679 Bldg 601	34687 Well 1	34694 Well 2	34701 Well 3	34708 Well 4
Base No.	GP830125	GP830130	GP830135	GP830140	GP830145
Benzene	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
Chlorobenzene	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
1,2-Dichlorobenzene	ND <2.0	ND <2.0	ND <2.0	ND <2.0	ND <2.0
1,3-Dichlorobenzene	ND <2.0	ND <2.0	ND <2.0	ND <2.0	ND <2.0
1,4-Dichlorobenzene	ND <2.0	ND <2.0	ND <2.0	ND <2.0	ND <2.0
Ethylbenzene	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
Toluene	ND <2.0	ND <2.0	ND <2.0	Trace <3.0	ND <2.0

Results in Micrograms per Liter

LEOPOLDO L. RODRIGUEZ, GS-12
Trace Organics Analysis Function
Environmental Chemistry Branch

ADRIAN SANCHEZ, GS-11
Trace Organics Analysis Function
Environmental Chemistry Branch

REQUESTING AGENCY *(Mailing Address)*

USAF Hospital/SGPB
Wurtsmith AFB MI 48753

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

Atch 1

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE: 21 July 83

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235

SAMPLE IDENTITY: Water

DATE RECEIVED: 6 July 83

SAMPLE FROM:

LAB CONTROL NR: See Below

TEST FOR: Volatile Aromatics

Methodology:	EPA 602
OEHL No.	34715 Well 5
Base No.	GP830150
Benzene	ND <1.0
Chlorobenzene	ND <1.0
1,2-Dichlorobenzene	ND <2.0
1,3-Dichlorobenzene	ND <2.0
1,4-Dichlorobenzene	ND <2.0
Ethylbenzene	ND <1.0
Toluene	ND <2.0

Results in Micrograms per Liter

LEOPOLDO L. RODRIGUEZ, GS-12
Trace Organics Analysis Function
Environmental Chemistry Branch

ADRIAN SANCHEZ, GS-11
Trace Organics Analysis Function
Environmental Chemistry Branch

REQUESTING AGENCY *(Mailing Address)*

USAF Hospital/SGPB
Wurtsmith AFB MI 48753

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 7 Aug 84

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235-5000

SAMPLE IDENTITY: Water

DATE RECEIVED: 7 Aug 84

SAMPLE FROM:

LAB CONTROL NR:

TEST FOR: Volatile Aromatics

METHODOLOGY: EPA 602

Well #	1	2	3	4	5	6
OEHL #	43796	43798	43800	43802	43804	43806
Base #	GP840034	GP840035	GP840036	GP840037	GP840038	GP840039
Benzene	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
Chlorobenzene	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
1, 2-Dichlorobenzene	ND<2	ND<2	ND<2	ND<2	ND<2	ND<2
1, 3-Dichlorobenzene	ND<2	ND<2	ND<2	ND<2	ND<2	ND<2
1, 4-Dichlorobenzene	ND<2	ND<2	ND<2	ND<2	ND<2	ND<2
Ethylbenzene	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
Toluene	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1

RESULTS IN MICROGRAMS PER LITER

ND - None detected. Less than the detection limit.
Trace - Present but less than the quantitative limit.

EDWARD J. BROWN, Captain, USAF, BSC
Chief, Volatile Organics Section

ANNA WILLIS
Physical Science Technician

REQUESTING AGENCY (Mailing Address)

MSgt David Penn
Phelps Collins ANGB
Alpena MI 49707-5000

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD

TO:	FROM: USAF OEHL/SA Brooks AFB TX 78235-5000

17 Aug 84

SAMPLE IDENTITY: WATER

DATE RECEIVED: 15 Aug 84

SAMPLE FROM:

LAB CONTROL NO: 45531

TEST FOR

VOLATILE AROMATICS
METHODOLOGY: EPA 602

OEHL NO:	45531 WELL #4
BASE NO:	GP840047
BENZENE	ND<1
CHLOROBENZENE	ND<1
1,2-DICHLOROBENZENE	ND<2
1,3-DICHLOROBENZENE	ND<2
1,4-DICHLOROBENZENE	ND<2
ETHYLBENZENE	ND<1
TOLUENE	ND<1

RESULTS IN MICROGRAMS PER LITER

ND-NONE DETECTED. LESS THAN THE DETECTION LIMIT
TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

EDWARD J. BROWN, Captain, USAF, BSC
Chief, Volatile Organics Section

ANNA WILLIS
Physical Science Technician

REQUESTING AGENCY (Mailing Address)

MSgt DAVID PENN
PHELPS COLLINS ANGB
ALPENA MI 49707-5000

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD

TO	FROM USAF OEHL/SA Brooks AFB TX 78235-5000	
SAMPLE IDENTITY Water		DATE RECEIVED 06 SEP 1984
SAMPLE FROM Phelps Collins		LAB CONTROL NR
TEST FOR Volatile Aromatics		

Methodology: EPA 602 well / BLDG-28

OEHL NO:	49687	49689			Detection Limit	
CASE NO:	GP84ØØ33	GP84ØØ54			ND	TR
Benzene	ND	ND			1.0	2.0
Chlorobenzene	ND	ND			1.0	2.0
1,2-Dichlorobenzene	ND	ND			2.0	3.0
1,3-Dichlorobenzene	ND	ND			2.0	3.0
1,4-Dichlorobenzene	ND	ND			2.0	3.0
Ethylbenzene	ND	ND			1.0	2.0
Toluene	ND	ND			1.0	2.0

Results in micrograms per liter.

ND - None detected Less than the detection limit
Trace - Present but less than the quantitative limit

Eric Barke 1LT USAF
CHEMIST

Edward J. [illegible] 6 DEC 1984

REQUESTING AGENCY (Mailing Address)
ANGSC/SGB
ANDREWS AFB MD
20331-5000

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE 0 6 DEC 1984

TO

FROM USAF OEHL/SA
Brooks AFB TX 78235-5000

SAMPLE IDENTITY
Water

DATE RECEIVED 18 SEP 1984

SAMPLE FROM
PHELPS COLLINS ANGB

LAB CONTROL NR

TEST FOR
Volatile Aromatics

Methodology: EPA 602

	WELL 1	WELL 3	EFFLUENT SEWAGE/BLDG 45		Detection Limit	
OEHL NO:	51738	51741	51743			
BASE NO:	GP840069	GP840071	GP840072		ND	TR
Benzene	ND	ND	ND		1.0	2.0
Chlorobenzene	ND	ND	ND		1.0	2.0
1,2-Dichlorobenzene	ND	ND	ND		2.0	3.0
1,3-Dichlorobenzene	ND	ND	ND		2.0	3.0
1,4-Dichlorobenzene	ND	ND	ND		2.0	3.0
Ethylbenzene	ND	ND	1.5		1.0	2.0
Toluene	ND	ND	18.2		1.0	2.0

Results in micrograms per liter.

ND - None detected Less than the detection limit
Trace - Present but less than the quantitative limit

Eric Banks 1LT USAF
CHEMIST

6 DEC 1984

REQUESTING AGENCY (Mailing Address)
ANGSC/SGB
ANDREWS AFB, MD
20331-5000

APPENDIX G

Part C

OEHL - TCE

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 8 July 83

TO:

FROM: USAF OEHL/SA Brooks AFB TX 78235

SAMPLE IDENTITY: Pot Water

DATE RECEIVED: 6 July 83

SAMPLE FROM: Phelps/Collins ANGB

LAB CONTROL NR:

TEST FOR: TCE

30 JUN 83

OEHL NUMBER	BASE NUMBER	µg/l	
34678	GP830124	4.1	BLDG 601
34686	GP830129	ND<0.1	WELL #1
34693	GP830134	ND<0.1	WELL #2
34700	GP830139	0.6	WELL #3
34707	GP830144	TR<0.2	WELL #4
34714	GP830149	0.3	WELL #5

µg/l-micrograms per liter.

TRACE-Present but less than the quantitative limit. 0.2µg/l

ND-None Detected. Less than the 0.1 µg/l detection limit.

LEOPOLDO L. RODRIGUEZ, GS-12
Trace Organics Analysis Function
Environmental Chemistry Branch

TIMOTHY PUGH, Technician
Trace Organics Analysis Function
Environmental Chemistry Branch

REQUESTING AGENCY (Mailing Address)

USAF Hosp/SGPB
Wurtsmith AFB MI 48753

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

Atch 15

APPENDIX G

Part D

OEHL

- Primary Drinking Water Standards

and

- Metals Screen

14:23

LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34682-684 00008	64830127 00029

SAMPLE COLLECTION INFORMATION

5. DATE RECEIVED BY LAB	6JUly83
6. DATE ANALYSIS COMPLETED	27Jul 83

7. SITE DESCRIPTION: Bldg 601

8. SITE LOCATION: 5 JUL 83

9. FLOW RATE AT SITE 00058 GAL/MIN

10. WEATHER 00041

ON-SITE ANALYTICAL RESULTS

16. WATER TEMP 000 10 °C | 17. PH 00400 UNITS | 18. DISS O_2 00300 MG/L

11. COLLECTION DATE/PERIOD

12. NAME OF COLLECTOR

19. RESULTS OF OTHER ON-SITE ANALYSES

13. SAMPLING TECHNIQUE

14. PHONE NUMBER

15. REASON FOR SAMPLE SUBMISSION

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F

PARAMETER	TOTAL	µ G/L	MAX LEV ALLWD
ARSENIC	01002	.	50 µ G/L
BARIUM	01007	.	1000 µ G/L
CADMIUM	01027	.	10. µ G/L
CHROMIUM	01034	.	50 µ G/L
LEAD	01051	.	50 µ G/L
MERCURY	71900	.	2 µ G/L
SELENIUM	01147	.	10 µ G/L
SILVER	01077	.	50 µ G/L

PRESERVATION GROUP C 202

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620	0.5	10 MG/L

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951	.	See table in AFR 161-44
TURBIDITY	00076	Units	1 Unit
Group A	682 (28)	.	
COD		<10	
Organ Carb		6	

B. OTHER ANALYSES

PRESERVATION GROUP F

PARAMETER	TOTAL	µG/L
COPPER	01042	.
IRON	01045	.
MANGANESE	01055	.
ZINC	01092	.
CALCIUM As Ca	00916	. mg/l
MAGNESIUM as Mg	00927	. mg/l
POTASSIUM	00937	. mg/l
SODIUM	00929	. mg/l

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	.
Acidity, Total, As $CaCO_3$	00435	.
Alkalin. Phenolth As $CaCO_3$	00415	.
Alkalinity, Total, As $CaCO_3$	00410	.
Chloride	00940	.
Hardness As $CaCO_3$	00900	.
Residue, Filtrable (TDS)	00515	.
Residue, Non-Filtrable (SS)	00530	.
Residue	00500	.
Specific Conductance	00095	µmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	.
Surfactants MBAS As LAS	38260	.
Group B 683		
Oil & Grease		<0.3
Group C 684		
Ammonia		1.7 mg/L

PRESERVATION GROUP J

PARAMETER		
K. Nitrogen		1.8
Nitrite		<.02
Nitrate		.5 mg/L

20. ORGANIZATION REQUESTING ANALYSIS

Ortho Phos <.1
Phos T <.1

Wurtsmith

CHEMIST: [signature]

REVIEWED BY

APPROVED BY: [signature] AHL3

POTABLE WATER ANALYSIS

~~[illegible]~~ 14,23

LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34685 00006	GP830128 00029

SAMPLE COLLECTION INFORMATION

SITE DESCRIPTION: BLDG 684 (6 JUL 83 13 18)

SITE LOCATION NO	FLOWRATE AT SITE 00088 GAL/MIN	10. WEATHER 00041

COLLECTION DATE/PERIOD | 12. NAME OF COLLECTOR

SAMPLING TECHNIQUE | 14. PHONE NUMBER

REASON FOR SAMPLE SUBMISSION

5. DATE RECEIVED BY LAB	6. DATE ANALYSIS COMPLETED
6 July 83	27 Jul 83

ON-SITE ANALYTICAL RESULTS

16. WATER TEMP 000 10 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L

19. RESULTS OF OTHER ON-SITE ANALYSES

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F

PARAMETER	TOTAL	µ G/L	MAX LEV ALLWD
ARSENIC	01002	.	50 µ G/L
BARIUM	01007	.	1000 µ G/L
CADMIUM	01027	.	10. µ G/L
CHROMIUM	01034	.	50 µ G/L
LEAD	01051	.	50 µ G/L
MERCURY	71900	.	2 µ G/L
SELENIUM	01147	.	10 µ G/L
SILVER	01077	.	50 µ G/L

PRESERVATION GROUP C

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620	.	10 MG/L

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951	.	*See table in AFR 161-44*
TURBIDITY	00076	Units	1 Unit

B. OTHER ANALYSES

PRESERVATION GROUP F 685

PARAMETER	TOTAL	µG/L
COPPER	01042	.
IRON	01045	.
MANGANESE	01055	.
ZINC	01092	.
CALCIUM As Ca	00916	. mg/l
MAGNESIUM As Mg	00927	. mg/l
POTASSIUM	00937	. mg/l
SODIUM	00929	. mg/l
Metals Screen		

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	.
Acidity, Total, As $CaCO_3$	00435	.
Alkalin, Phenolth As $CaCO_3$	00415	.
Alkalinity, Total, As $CaCO_3$	00410	.
Chloride	00940	.
Hardness As $CaCO_3$	00900	.
Residue, Filtrable *(TDS)*	00515	.
Residue, Non-Filtrable *(SS)*	00530	.
Residue	00500	.
Specific Conductance	00095	µmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	.
Surfactants MBAS As LAS	38260	.

PRESERVATION GROUP J

PARAMETER		

ORGANIZATION REQUESTING ANALYSIS

Wurtsmith

CHEMIST: [signature]

REVIEWED BY

APPROVED BY: [signature]

Atch 4

14.23

LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34689-691 00008	GP830132 00029

SAMPLE COLLECTION INFORMATION		5. DATE RECEIVED BY LAB	6. DATE ANALYSIS COMPLETED
7. SITE DESCRIPTION: WELL #1		6 JUN 83	27 J-N 83

8. SITE LOCATION NO	9. FLOW RATE AT SITE 00058 GAL/MIN	10. WEATHER 00041	16. WATER TEMP 000 10 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L
11. COLLECTION DATE/PERIOD		12. NAME OF COLLECTOR	19. RESULTS OF OTHER ON-SITE ANALYSES		
13. SAMPLING TECHNIQUE		14. PHONE NUMBER			
15. REASON FOR SAMPLE SUBMISSION					

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F				PRESERVATION GROUP C 202			
PARAMETER	TOTAL	μ G/L	MAX LEV ALLWD	PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
ARSENIC	01002	.	50 μ G/L	NITRATE AS N (Cadmium Reduction Method)	00620	<.1	10 MG/L
BARIUM	01007	.	1000 μ G/L	PRESERVATION GROUP G			
				PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
CADMIUM	01027	.	10. μ G/L	FLUORIDE	00951	.	See table in AFR 161-44
CHROMIUM	01034	.	50 μ G/L	TURBIDITY	00076	Units	1 Unit
LEAD	01051	.	50 μ G/L	Group A 689			
MERCURY	71900	.	2 μ G/L	COD		20	
SELENIUM	01147	.	10 μ G/L	Organic Carbon		3	
SILVER	01077	.	50 μ G/L	Group B 690			
				Oil & Grease		<0.3	

B. OTHER ANALYSES

PRESERVATION GROUP F			PRESERVATION GROUP G					
PARAMETER	TOTAL	μG/L	PARAMETER	TOTAL	MG/L	PARAMETER	TOTAL	MG/L
COPPER	01042	.	Acidity, Mineral As $CaCO_3$	00436	.	Sulfate As SO_4	00945	.
IRON	01045	.	Acidity, Total, As $CaCO_3$	00435	.	Surfactants MBAS As LAS	38260	.
MANGANESE	01055	.	Alkalin, Phenolth As $CaCO_3$	00415	.	Group C	691	
ZINC	01092	.	Alkalinity, Total, As $CaCO_3$	00410	.	Ammonia		<.2 mg/L
CALCIUM As Ca	00916	. mg/l	Chloride	00940	.	K. Nitro *		~~1.2~~
MAGNESIUM as Mg	00927	. mg/l	Hardness As $CaCO_3$	00900	.	Nitrate		<.1 mg/L
POTASSIUM	00937	. mg/l	Residue, Filtrable (TDS)	00515	.	~~PRESERVATION GROUP~~		
SODIUM	00929	. mg/l	Residue, Non-Filtrable (SS)	00530	.	~~PARAMETER~~ Nitrite		<.02
			Residue	00500	.	Ortho Phos		<.1
			Specific Conductance	00095	. μmhos	Phos T		<.1

ORGANIZATION REQUESTING ANALYSIS	CHEMIST
* total Kjeldahl Nitrogen = 1.2 MG/L	RB BGR AH
	REVIEWED BY
	APPROVED BY
Wurtsmith	Atch 5

14.23

LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34692 00008	6A830133 00029

SAMPLE COLLECTION INFORMATION			5. DATE RECEIVED BY LAB	6. DATE ANALYSIS COMPLETED
SITE DESCRIPTION WELL #1 6 JUL 83 1518 W			6 July 83	27 Jul 83

ON-SITE ANALYTICAL RESULTS

SITE LOCATION NO	9. FLOWRATE AT SITE 00058 GAL/MIN	10. WEATHER 00041	16. WATER TEMP 00010 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L

COLLECTION DATE/PERIOD	12. NAME OF COLLECTOR	19. RESULTS OF OTHER ON-SITE ANALYSES
SAMPLING TECHNIQUE	14. PHONE NUMBER	
REASON FOR SAMPLE SUBMISSION		

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F 195

PARAMETER	TOTAL	µG/L	MAX LEV ALLWD
ARSENIC	01002	L10	50 µG/L
BARIUM	01007	536	1000 µG/L
CADMIUM	01027	L10	10. µG/L
CHROMIUM	01034	L50	50 µG/L
LEAD	01051	L20	50 µG/L
MERCURY	71900	L1	2 µG/L
SELENIUM	01147	L10	10 µG/L
SILVER	01077	L10	50 µG/L

PRESERVATION GROUP C

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620		10 MG/L

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951		See table in AFR 161-44
TURBIDITY	00076	Units	1 Unit

B. OTHER ANALYSES

PRESERVATION GROUP F 692

PARAMETER	TOTAL	µG/L
COPPER	01042	L20
IRON	01045	1422
MANGANESE	01055	L50
ZINC	01092	L50
CALCIUM As Ca	00916	216.2 mg
MAGNESIUM as Mg	00927	60.4 mg
POTASSIUM	00937	0.2 mg
SODIUM	00929	154.8 mg
Metals Screen		
nickel		L50

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	
Acidity, Total, As $CaCO_3$	00435	
Alkalin, Phenolth As $CaCO_3$	00415	
Alkalinity, Total, As $CaCO_3$	00410	
Chloride	00940	
Hardness As $CaCO_3$	00900	
Residue, Filtrable (TDS)	00515	
Residue, Non-Filtrable (SS)	00530	
Residue	00500	
Specific Conductance	00095	µmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	
Surfactants MBAS As LAS	38260	

PRESERVATION GROUP J

PARAMETER		

ORGANIZATION REQUESTING ANALYSIS	CHEMIST
Wurtsmith	LTT with EH
	REVIEWED BY
	APPROVED BY A1 ch 6

14.23

BORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34696-698 00008	GP830137 00029

SAMPLE COLLECTION INFORMATION

5. DATE RECEIVED BY LAB: 6 July 83
6. DATE ANALYSIS COMPLETED: 27 July 83

E DESCRIPTION: WELL #2

6 Jul 83 15 18

E LOCATION NO — ATE AT SITE 00058 GAL/MIN — 10. WEATHER 00041

ON-SITE ANALYTICAL RESULTS

16. WATER TEMP 000 10 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L

COLLECTION DATE/PERIOD — 12. NAME OF COLLECTOR — 19. RESULTS OF OTHER ON-SITE ANALYSES

MPLING TECHNIQUE — 14. PHONE NUMBER

REASON FOR SAMPLE SUBMISSION

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F				PRESERVATION GROUP C (26)			
PARAMETER	TOTAL	µ G/L	MAX LEV ALLWD	PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
RSENIC	01002	.	50 µ G/L	NITRATE AS N (Cadmium Reduction Method)	00620	0.4	10 MG/L
IUM	01007		1000 µ G/L	PRESERVATION GROUP G			
				PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
ADMIUM	01027	.	10. µ G/L	FLUORIDE	00951	.	See table in AFR 161-44
OMIUM	01034	.	50 µ G/L	TURBIDITY	00076	Units	1 Unit
AD	01051	.	50 µ G/L	Group A 696			
CURY	71900	.	2 µ G/L	COD		100	
ENIUM	01147	.	10 µ G/L	Organic Carbon		3	
VER	01077	.	50 µ G/L	Group B 697			

B. OTHER ANALYSES — Oil + Grease <0.3

PRESERVATION GROUP F			PRESERVATION GROUP					
PARAMETER	TOTAL	µG/L	PARAMETER	TOTAL	MG/L	PARAMETER	TOTAL	MG/L
PER	01042	.	Acidity, Mineral As $CaCO_3$	00436	.	Sulfate As SO_4	00945	.
	01045	.	Acidity, Total, As $CaCO_3$	00435	.	Surfactants MBAS As LAS	38260	.
GANESE	01055	.	Alkalin, Phenolth As $CaCO_3$	00415	.	Group C 698		
C	01092	.	Alkalinity, Total, As $CaCO_3$	00410	.	Ammonia		.4
CIUM As Ca	00916	mg .	Chloride	00940	.	K. Nitrogen		<1
NESIUM as Mg	00927	mg .	Hardness As $CaCO_3$	00900	.	~~Nitrate~~		
TASSIUM	00937	mg .	Residue, Filtrable (TDS)	00515	.	~~PRESERVATION GROUP~~		
IUM	00929	mg .	Residue Non-Filtrable (SS)	00530	.	Nitrite		0.26
			Residue	00500	.	Ortho Phos		<.1
			Specific Conductance	00095	µmhos	Phos T		<.1

RGANIZATION REQUESTING ANALYSIS

Wurtsmith

CHEMIST

SEL BH Jt ru

REVIEWED BY

APPROVED BY

[signature] A4-17

14.23

LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34699 00008	GP830138 00029

SAMPLE COLLECTION INFORMATION

SITE DESCRIPTION: WELL #2

5. DATE RECEIVED BY LAB: 6 July 83

6. DATE ANALYSIS COMPLETED: 27 Jul 83

SITE LOCATION NO — 6 Jul 83 — FLOWRATE AT SITE 0005 GAL/MIN — 10. WEATHER 00041

ON-SITE ANALYTICAL RESULTS

16. WATER TEMP 00010 °C — 17. PH 00400 UNITS — 18. DISS O_2 00300 MG/L

COLLECTION DATE/PERIOD — 12. NAME OF COLLECTOR — 19. RESULTS OF OTHER ON-SITE ANALYSES

SAMPLING TECHNIQUE — 14. PHONE NUMBER

REASON FOR SAMPLE SUBMISSION

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F (195)

PARAMETER	TOTAL	µG/L	MAX LEV ALLWD
ARSENIC	01002	L10	50 µG/L
BARIUM	01007	285	1000 µG/L
CADMIUM	01027	L10	10. µG/L
CHROMIUM	01034	L50	50 µG/L
LEAD	01051	L20	50 µG/L
MERCURY	71900	L1	2 µG/L
SELENIUM	01147	L10	10 µG/L
SILVER	01077	L10	50 µG/L

PRESERVATION GROUP C

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620		10 MG/L

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951		See table in AFR 161-44
TURBIDITY	00076	Units	1 Unit

B. OTHER ANALYSES

PRESERVATION GROUP F (699)

PARAMETER	TOTAL	µG/L
COPPER	01042	L20
IRON	01045	995
MANGANESE	01055	L50
ZINC	01092	L50
CALCIUM As Ca	00916	154.6 mg/l
MAGNESIUM as Mg	00927	45.1 mg/l
POTASSIUM	00937	0.5 mg/l
SODIUM	00929	2.38 mg/l
Metals Screen		
Nickel		L50

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	
Acidity, Total, As $CaCO_3$	00435	
Alkalin, Phenolth As $CaCO_3$	00415	
Alkalinity, Total, As $CaCO_3$	00410	
Chloride	00940	
Hardness As $CaCO_3$	00900	
Residue, Filtrable (TDS)	00515	
Residue, Non-Filtrable (SS)	00530	
Residue	00500	
Specific Conductance	00095	µmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	
Surfactants MBAS As LAS	38260	

PRESERVATION GROUP J

PARAMETER		

ORGANIZATION REQUESTING ANALYSIS

Wintsmith

CHEMIST: [illegible]

REVIEWED BY

APPROVED BY: [illegible signature] Aug 8

POTABLE WATER ANALYSIS

1423

LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34703-705 00008	GP830142 00029

SAMPLE COLLECTION INFORMATION

5. DATE RECEIVED BY LAB	6. DATE ANALYSIS COMPLETED
6 July 83	27 Jul 83

SITE DESCRIPTION: WELL #3

SITE LOCATION NO: 6 JUL 83 15 18

FLOWRATE AT SITE 00058 GAL/MIN

10. WEATHER 00041

ON-SITE ANALYTICAL RESULTS

16. WATER TEMP 000 10 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L

11. COLLECTION DATE/PERIOD

12. NAME OF COLLECTOR

13. SAMPLING TECHNIQUE

14. PHONE NUMBER

15. REASON FOR SAMPLE SUBMISSION

19. RESULTS OF OTHER ON-SITE ANALYSES

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F

PARAMETER	TOTAL	µ G/L	MAX LEV ALLWD
ARSENIC	01002	.	50 µ G/L
BARIUM	01007	.	1000 µ G/L
CADMIUM	01027	.	10. µ G/L
CHROMIUM	01034	.	50 µ G/L
LEAD	01051	.	50 µ G/L
MERCURY	71900	.	2 µ G/L
SELENIUM	01147	.	10 µ G/L
SILVER	01077	.	50 µ G/L

PRESERVATION GROUP C 202

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620	1.4	10 MG/L

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951	.	See table in AFR 161-44
TURBIDITY	00076	Units	1 Unit
Group A	703		
COD		<10	
Organic Carbon		6	
Group B	704		
Oil + Grease		<0.3	

B. OTHER ANALYSES

PRESERVATION GROUP F

PARAMETER	TOTAL	µG/L
COPPER	01042	.
IRON	01045	.
MANGANESE	01055	.
ZINC	01092	.
CALCIUM As Ca	00916	. mg/l
MAGNESIUM as Mg	00927	. mg/l
POTASSIUM	00937	. mg/l
SODIUM	00929	. mg/l

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	.
Acidity, Total, As $CaCO_3$	00435	.
Alkalin, Phenolth As $CaCO_3$	00415	.
Alkalinity, Total, As $CaCO_3$	00410	.
Chloride	00940	.
Hardness As $CaCO_3$	00900	.
Residue, Filtrable (TDS)	00515	.
Residue, Non-Filtrable (SS)	00530	.
Residue	00500	.
Specific Conductance	00095	µmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	.
Surfactants MBAS As LAS	38260	.
Group C 705		
Ammonia		<.2
K. Nitrogen		<1
Nitrite		<.02
~~PRESERVATION GROUP J~~		
~~Nitrate~~		
Ortho phos		<.1
Phos T		<.1

ORGANIZATION REQUESTING ANALYSIS

Wurtsmith

CHEMIST: RG BH # DB

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APPROVED BY: [signature] Atch 9

POTABLE WATER ANALYSIS

14.23

LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34706 00006	GP830143 00029

SAMPLE COLLECTION INFORMATION

SITE DESCRIPTION: WELL #3 6 JUL 83 1518

5. DATE RECEIVED BY LAB	6. DATE ANALYSIS COMPLETED
6 July 83	27 Jul 83

SITE LOCATION NO	9. FLOWRATE AT SITE 00058 GAL/MIN	10. WEATHER 00041

ON-SITE ANALYTICAL RESULTS

16. WATER TEMP 000 10 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L

COLLECTION DATE/PERIOD

12. NAME OF COLLECTOR

19. RESULTS OF OTHER ON-SITE ANALYSES

SAMPLING TECHNIQUE

14. PHONE NUMBER

REASON FOR SAMPLE SUBMISSION

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F (145)

PARAMETER	TOTAL	µ G/L	MAX LEV ALLWD
ARSENIC	01002	<10.	50 µ G/L
BARIUM	01007	<200.	1000 µ G/L
CADMIUM	01027	<10.	10. µ G/L
CHROMIUM	01034	<50.	50 µ G/L
LEAD	01051	<20.	50 µ G/L
MERCURY	71900	<1.	2 µ G/L
SELENIUM	01147	<10.	10 µ G/L
SILVER	01077	<10.	50 µ G/L

PRESERVATION GROUP C

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620	.	10 MG/L

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951	.	See table in AFR 161-44
TURBIDITY	00076	Units	1 Unit

B. OTHER ANALYSES

PRESERVATION GROUP F 706

PARAMETER	TOTAL	µG/L
COPPER	01042	<20.
IRON	01045	<100.
MANGANESE	01055	<50.
ZINC	01092	67.
CALCIUM As Ca	00916	45.9 mg
MAGNESIUM as Mg	00927	10.9 mg
POTASSIUM	00937	0.5 mg
SODIUM	00929	10.6 mg
Nitrate Screen		
Nickel		<50

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	.
Acidity, Total, As $CaCO_3$	00435	.
Alkalin, Phenolth As $CaCO_3$	00415	.
Alkalinity, Total, As $CaCO_3$	00410	.
Chloride	00940	.
Hardness As $CaCO_3$	00900	.
Residue, Filtrable (TDS)	00515	.
Residue, Non-Filtrable (SS)	00530	.
Residue	00500	.
Specific Conductanc.	00095	µmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	.
Surfactants MBAS As LAS	38260	.

PRESERVATION GROUP J

PARAMETER		

ORGANIZATION REQUESTING ANALYSIS

Wurtsmith

CHEMIST

LJJ ... EH

REVIEWED BY

APPROVED BY

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14.23

BORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34710-712 00008	GP830147 00029

SAMPLE COLLECTION INFORMATION

E DESCRIPTION	5. DATE RECEIVED BY LAB	6. DATE ANALYSIS COMPLETED
WELL #4 6 JUL 83 1519	6 July 83	27 July 83

ON-SITE ANALYTICAL RESULTS

SITE LOCATION NO	9. FLOWRATE AT SITE 00058 GAL/MIN	10. WEATHER 00041	16. WATER TEMP 000 10 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L

LLECTION DATE/PERIOD	12. NAME OF COLLECTOR	19. RESULTS OF OTHER ON-SITE ANALYSES
SAMPLING TECHNIQUE	14. PHONE NUMBER	
EASON FOR SAMPLE SUBMISSION		

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F				PRESERVATION GROUP C 102			
PARAMETER	TOTAL	µ G/L	MAX LEV ALLWD	PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
ARSENIC	01002	.	50 µ G/L	NITRATE AS N (Cadmium Reduction Method)	00620	< .1	10 MG/L
BARIUM	01007	.	1000 µ G/L	PRESERVATION GROUP G			
				PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
CADMIUM	01027	.	10. µ G/L	FLUORIDE	00951	.	See table in AFR 161-44
CHROMIUM	01034	.	50 µ G/L	TURBIDITY	00076	Units	1 Unit
LEAD	01051	.	50 µ G/L	GROUP A 710		.	
MERCURY	71900	.	2 µ G/L	COD		<10	
SELENIUM	01147	.	10 µ G/L	Organ Carb		2	
SILVER	01077	.	50 µ G/L	GROUP B 711			

B. OTHER ANALYSES Oil + Grease <0.3

PRESERVATION GROUP F			PRESERVATION GROUP G					
PARAMETER	TOTAL	µG/L	PARAMETER	TOTAL	MG/L	PARAMETER	TOTAL	MG/L
COPPER	01042	.	Acidity, Mineral As $CaCO_3$	00436	.	Sulfate As SO_4	00945	.
IRON	01045	.	Acidity, Total, As $CaCO_3$	00435	.	Surfactants MBAS As LAS	38260	.
MANGANESE	01055	.	Alkalin, Phenolth As $CaCO_3$	00415	.	GROUP C 712		
ZINC	01092	.	Alkalinity, Total, As $CaCO_3$	00410	.	Ammonia		<.2
CALCIUM As Ca	00916	. mg/l	Chloride	00940	.	K. Nitrogen		<1
MAGNESIUM as Mg	00927	. mg/l	Hardness As $CaCO_3$	00900	.	~~Nitrate~~		
POTASSIUM	00937	. mg/l	Residue, Filtrable (TDS)	00515	.	PRESERVATION GROUP J		
						PARAMETER		
SODIUM	00929	. mg/l	Residue, Non-Filtrable (SS)	00530	.	Nitrite		<.02
			Residue	00500	.	Orthophos		<.1
			Specific Conductance	00095	µmhos	Phos T		<.1

ORGANIZATION REQUESTING ANALYSIS	CHEMIST
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	REVIEWED BY
	APPROVED BY
Wurtsmith	Atch 11

FORM

POTABLE WATER ANALYSIS

14.23

LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34713 00008	GP830148 00029

SAMPLE COLLECTION INFORMATION

SITE DESCRIPTION: WELL #4		5. DATE RECEIVED BY LAB: 6 JUL 83	6. DATE ANALYSIS COMPLETED: 27 JUL 83
SITE LOCATION NO. JUL 83 FLOW RATE AT SITE 00058 GAL/MIN	10. WEATHER 00041	ON-SITE ANALYTICAL RESULTS	
COLLECTION DATE/PERIOD	12. NAME OF COLLECTOR	16. WATER TEMP 000 10 °C; 17. PH 00400 UNITS; 18. DISS O_2 00300 MG/L	
SAMPLING TECHNIQUE	14. PHONE NUMBER	19. RESULTS OF OTHER ON-SITE ANALYSES	
REASON FOR SAMPLE SUBMISSION			

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F 195

PARAMETER	TOTAL	µ G/L	MAX LEV ALLWD
ARSENIC	01002	L10.	50 µ G/L
BARIUM	01007	L200.	1000 µ G/L
CADMIUM	01027	L10.	10. µ G/L
CHROMIUM	01034	L50.	50 µ G/L
LEAD	01051	L20.	50 µ G/L
MERCURY	71900	L1.	2 µ G/L
SELENIUM	01147	L10.	10 µ G/L
SILVER	01077	L10.	50 µ G/L

PRESERVATION GROUP C

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620	.	10 MG/L

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951	.	See table in AFR 161-44
TURBIDITY	00076	Units .	1 Unit

B. OTHER ANALYSES

PRESERVATION GROUP F 713

PARAMETER	TOTAL	µG/L
COPPER	01042	L20.
IRON	01045	349.
MANGANESE	01055	L50.
ZINC	01092	L50.
CALCIUM As Ca	00916	24.5 mg
MAGNESIUM as Mg	00927	8.6 mg
POTASSIUM	00937	1.3 mg
SODIUM	00929	7.5 mg
Nitrate screen		
Nickel		L50

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	.
Acidity, Total, As $CaCO_3$	00435	.
Alkalin, Phenolth As $CaCO_3$	00415	.
Alkalinity, Total, As $CaCO_3$	00410	.
Chloride	00940	.
Hardness As $CaCO_3$	00900	.
Residue, Filtrable (TDS)	00515	.
Residue, Non-Filtrable (SS)	00530	.
Residue	00500	.
Specific Conductance	00095	µmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	.
Surfactants MBAS As LAS	38260	.

PRESERVATION GROUP J

PARAMETER		

ORGANIZATION REQUESTING ANALYSIS	
Wurtsmith	CHEMIST: LJJ ... EH
	REVIEWED BY
	APPROVED BY: AtcL12 [signature]

14.23

1. LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	4. REQUESTOR SAMPLE NUMBER
OEHL	34717-719 00008	GP830152 00029

SAMPLE COLLECTION INFORMATION

5. DATE RECEIVED BY LAB	6 July 83
6. DATE ANALYSIS COMPLETED	27 July 83
7. SITE DESCRIPTION	WELL #5 6 Jul 83 15 10
8. SITE LOCATION NO	
9. FLOW RATE AT SITE 00058 GAL/MIN	
10. WEATHER 00041	
11. COLLECTION DATE/PERIOD	
12. NAME OF COLLECTOR	
13. SAMPLING TECHNIQUE	
14. PHONE NUMBER	
15. REASON FOR SAMPLE SUBMISSION	

ON-SITE ANALYTICAL RESULTS

16. WATER TEMP 000 10 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L

19. RESULTS OF OTHER ON-SITE ANALYSES

ANALYSES REQUESTED AND RESULTS

A. PRIMARY DRINKING WATER STANDARDS (40CFR 141)

PRESERVATION GROUP F

PARAMETER	TOTAL	µ G/L	MAX LEV ALLWD
ARSENIC	01002	.	50 µ G/L
BARIUM	01007	.	1000 µ G/L
CADMIUM	01027	.	10. µ G/L
CHROMIUM	01034	.	50 µ G/L
LEAD	01051	.	50 µ G/L
MERCURY	71900	.	2 µ G/L
SELENIUM	01147	.	10 µ G/L
SILVER	01077	.	50 µ G/L

PRESERVATION GROUP C 2C–

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620	<.1	10 MG/L

PRESERVATION GROUP B

PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951	.	See table in AFR 161-44
TURBIDITY	00076	Units	1 Unit
Group A 717			
COD		<10	
Organic Carbon		3	
Group B 718			
Oil + Grease		<0.3	

B. OTHER ANALYSES

PRESERVATION GROUP F

PARAMETER	TOTAL	µG/L
COPPER	01042	.
IRON	01045	.
MANGANESE	01055	.
ZINC	01092	.
CALCIUM As Ca	00916	. mg/l
MAGNESIUM as Mg	00927	. mg/l
POTASSIUM	00937	. mg/l
SODIUM	00929	. mg/l

PRESERVATION GROUP G

PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	.
Acidity, Total, As $CaCO_3$	00435	.
Alkalin, Phenolth As $CaCO_3$	00415	.
Alkalinity, Total, As $CaCO_3$	00410	.
Chloride	00940	.
Hardness As $CaCO_3$	00900	.
Residue, Filtrable (TDS)	00515	.
Residue, Non-Filtrable (SS)	00530	.
Residue	00500	.
Specific Conductance	00095	µmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	.
Surfactants MBAS As LAS	38260	.
Group C 719		
Ammonia		.3
K. Nitrogen		<1
~~Nitrate~~		
~~PRESERVATION GROUP~~		
Nitrite		<.02
Orthophos		<.1
Phos T		<.1

ORGANIZATION REQUESTING ANALYSIS

Wurtsmith

CHEMIST

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REVIEWED BY

APPROVED BY

[illegible]

1. LABORATORY PERFORMING ANALYSIS	3. LAB SAMPLE NUMBER	REQUESTOR SAMPLE NUMBER
OEHL	34681	00008 GP830153 00029

SAMPLE COLLECTION INFORMATION

7. SITE DESCRIPTION	WELL #5
8. SITE LOCATION NO	6 JUL 83 15 55
9. FLOW RATE AT SITE 00056 GAL/MIN	
10. WEATHER 00041	
11. COLLECTION DATE/PERIOD	
12. NAME OF COLLECTOR	
13. SAMPLING TECHNIQUE	
14. PHONE NUMBER	
15. REASON FOR SAMPLE SUBMISSION	
5. DATE RECEIVED BY LAB	6 Jul 83
6. DATE ANALYSIS COMPLETED	27 Jul 83

ON-SITE ANALYTICAL RESULTS

16. WATER TEMP 000 10 °C	17. PH 00400 UNITS	18. DISS O_2 00300 MG/L

19. RESULTS OF OTHER ON-SITE ANALYSES

ANALYSES REQUESTED AND RESULTS

A. PRIMARY ~~DRINKING~~ WATER STANDARDS (40CFR 141)

185

PRESERVATION GROUP F			
PARAMETER	TOTAL	μG/L	MAX LEV ALLWD
ARSENIC	01002	<10.	50 μG/L
BARIUM	01007	<200.	1000 μG/L
CADMIUM	01027	<10.	10. μG/L
CHROMIUM	01034	<50.	50 μG/L
LEAD	01051	<20.	50 μG/L
MERCURY	71900	<1.	2 μG/L
SELENIUM	01147	<10.	10 μG/L
SILVER	01077	<10.	50 μG/L

PRESERVATION GROUP C			
PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
NITRATE AS N (Cadmium Reduction Method)	00620	.	10 MG/L
PRESERVATION GROUP G			
PARAMETER	TOTAL	MG/L	MAX LEV ALLWD
FLUORIDE	00951	.	See table in AFR 161-44
TURBIDITY	00076	Units	1 Unit

B. OTHER ANALYSES

PRESERVATION GROUP F		
PARAMETER	TOTAL	μG/L
COPPER	01042	<20.
IRON	01045	176.
MANGANESE	01055	<50.
ZINC	01092	75.
CALCIUM As Ca	00916	10.1 mg/l
MAGNESIUM as Mg	00927	5.7 mg/l
POTASSIUM	00937	5.6 mg/l
SODIUM	00929	38.7 mg/l
Metal Screen		
Nickel		<50

PRESERVATION GROUP G		
PARAMETER	TOTAL	MG/L
Acidity, Mineral As $CaCO_3$	00436	.
Acidity, Total, As $CaCO_3$	00435	.
Alkalin, Phenolth As $CaCO_3$	00415	.
Alkalinity, Total, As $CaCO_3$	00410	.
Chloride	00940	.
Hardness As $CaCO_3$	00900	.
Residue, Filtrable (TDS)	00515	.
Residue, Non-Filtrable (SS)	00530	.
Residue	00500	.
Specific Conductance	00095	μmhos

PARAMETER	TOTAL	MG/L
Sulfate As SO_4	00945	.
Surfactants MBAS As LAS	38260	.

PRESERVATION GROUP J
PARAMETER

ORGANIZATION REQUESTING ANALYSIS

USAF HOSP / SGPB
Wurtsmith AFB MI 48753

CHEMIST: LJJ wh EH

REVIEWED BY

APPROVED BY: [signature] A Lch 14

POTABLE WATER ANALYSIS

APPENDIX G

Part E

MDPH

- Volatile Halocarbons

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8306-01826 Page: 1
PROGRAM CODE: 14

REPORT TO.

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 06/15/83
Date reported: 06/21/83

Examiner in Charge:

DMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG BASE
Street Address: PC ANG BASE
City or Twp: ALPENA
County: ALPENA

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 06/13/83

WELL #3

Test Name	Test Result	Standard Health MCL	Detection Test Limit
BROMOETHANE	Not Detected		0.001mg/l
BROMOFORM	Not Detected	0.10mg/l	0.001mg/l
CARBON TETRACHLORIDE	Not Detected		0.001mg/l
CHLOROBENZENE	Not Detected		0.001mg/l
CHLORODIBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
CHLOROETHANE	Not Detected		0.010mg/l
CHLOROFORM	Not Detected	0.10mg/l	0.001mg/l
DICHLOROBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
DICHLOROETHANE, 1,2-	Not Detected		0.001mg/l
DICHLOROETHANE, 1,1-	Not Detected		0.001mg/l
DICHLOROETHYLENE, TRANS-1,2,	Not Detected		0.001mg/l
DICHLOROETHYLENE, CIS-1,2,	Not Detected		0.001mg/l
DICHLOROPROPANE, 1,2-	Not Detected		0.001mg/l
DICHLOROPROPYLENE, TRANS-1,3,	Not Detected		0.001mg/l
DICHLOROPROPYLENE, CIS-1,3,	Not Detected		0.001mg/l
ETHYLENE DIBROMIDE	Not Detected		0.001mg/l
FLUOROTRICHLOROMETHANE	Not Detected		0.010mg/l
HEXACHLOROETHANE	Not Detected		0.001mg/l
METHYL BROMIDE	Not Detected		0.001mg/l
METHYL CHLORIDE	Not Detected		0.050mg/l
METHYLENE CHLORIDE	Not Detected		0.001mg/l
TETRACHLOROETHANE, 1,1,2,2-	Not Detected		0.001mg/l
TETRACHLOROETHYLENE	Not Detected		0.001mg/l
TOTAL TRIHALOMETHANES	Not Detected	0.10mg/l	0.001mg/l
TRICHLOROETHANE, 1,1,2-	Not Detected		0.001mg/l
TRICHLOROETHANE, 1,1,1-	Not Detected		0.001mg/l
TRICHLOROETHYLENE	0.010mg/l		
VINYL CHLORIDE	Not Detected		0.005mg/l
VINYLIDENE CHLORIDE	Not Detected		0.001mg/l
BENZENE	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,4-	Not Detected		0.001mg/l

(CONTINUED)

F-31 2/83 By Authority of Act 368 PA 1978 as amended JUN 23 1983 3

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8306-01826 Page: 2
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 06/15/83
Date reported: 06/21/83

Examiner in Charge: FMSaad

SAMPLE SOURCE INFORMATION:
System Owner: PHELPS COLLINS ANG BASE
Street Address: PC ANG BASE
City or Twp: ALPENA
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 06/13/83

WELL #3

Test Name	Test Result	Standard Health MCL	Detection Test Limit
DICHLOROBENZENE, 1,3-	Not Detected		0.001mg/1
DICHLOROBENZENE, 1,2-	Not Detected		0.001mg/1
ETHER	Not Detected		0.001mg/1
ETHYLBENZENE	Not Detected		0.001mg/1
METHYLETHYL KETONE	Not Detected		0.02mg/1
METHYL ISOBUTYL KETONE	Not Detected		0.020mg/1
STYRENE	Not Detected		0.001mg/1
TOLUENE	Not Detected		0.001mg/1
XYLENE	Not Detected		0.001mg/1

-31 2/83 By Authority of Act 368:PA 1976 as amended JUN 23 1983 3

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03911 Page: 1
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 09/04/84

Examiner in Charge:

FMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG.
Street Address: WELL #1
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
BROMOETHANE	Not Detected		0.001mg/l
BROMOFORM	Not Detected	0.10mg/l	0.001mg/l
CARBON TETRACHLORIDE	Not Detected		0.001mg/l
CHLOROBENZENE	Not Detected		0.001mg/l
CHLORODIBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
CHLOROETHANE	Not Detected		0.010mg/l
CHLOROFORM	Not Detected	0.10mg/l	0.001mg/l
DICHLOROBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
DICHLOROETHANE, 1,2-	Not Detected		0.001mg/l
DICHLOROETHANE, 1,1-	Not Detected		0.001mg/l
DICHLOROETHYLENE, TRANS-1,2,	Not Detected		0.001mg/l
DICHLOROETHYLENE, CIS-1,2,	Not Detected		0.001mg/l
DICHLOROPROPANE, 1,2-	Not Detected		0.001mg/l
DICHLOROPROPYLENE, TRANS-1,3,	Not Detected		0.001mg/l
DICHLOROPROPYLENE, CIS-1,3,	Not Detected		0.001mg/l
ETHYLENE DIBROMIDE	Not Detected		0.001mg/l
FLUOROTRICHLOROMETHANE	Not Detected		0.010mg/l
HEXACHLOROETHANE	Not Detected		0.001mg/l
METHYL BROMIDE	Not Detected		0.001mg/l
METHYL CHLORIDE	Not Detected		0.050mg/l
METHYLENE CHLORIDE	Not Detected		0.001mg/l
TETRACHLOROETHANE, 1,1,2,2-	Not Detected		0.001mg/l
TETRACHLOROETHYLENE	Not Detected		0.001mg/l
TOTAL TRIHALOMETHANES	Not Detected	0.10mg/l	0.001mg/l
TRICHLOROETHANE, 1,1,2-	Not Detected		0.001mg/l
TRICHLOROETHANE, 1,1,1-	Not Detected		0.001mg/l
TRICHLOROETHYLENE	Not Detected		0.001mg/l
VINYL CHLORIDE	Not Detected		0.005mg/l
VINYLIDENE CHLORIDE	Not Detected		0.001mg/l
BENZENE	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,4-	Not Detected		0.001mg/l

(CONTINUED)

F-31 2/83 By Authority of Act 368 PA 1978 as amended SEP 6 1984

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03911 Page: 2
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 09/04/84

Examiner in Charge: FMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG.
Street Address: WELL #1
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
DICHLOROBENZENE, 1,3-	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,2-	Not Detected		0.001mg/l
ETHYLBENZENE	Not Detected		0.001mg/l
METHYLETHYL KETONE	Not Detected		0.02mg/l
METHYL ISOBUTYL KETONE	Not Detected		0.020mg/l
STYRENE	Not Detected		0.001mg/l
TOLUENE	Not Detected		0.001mg/l
XYLENE	Not Detected		0.001mg/l

F-31 2/83 By Authority of Act 368 PA 1978 as amended SEP 6 1984

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03910 Page: 1
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:
DMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG.
Street Address: WELL #2
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
BROMOETHANE	Not Detected		0.001mg/l
BROMOFORM	Not Detected	0.10mg/l	0.001mg/l
CARBON TETRACHLORIDE	Not Detected		0.001mg/l
CHLOROBENZENE	Not Detected		0.001mg/l
CHLORODIBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
CHLOROETHANE	Not Detected		0.010mg/l
CHLOROFORM	Not Detected	0.10mg/l	0.001mg/l
DICHLOROBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
DICHLOROETHANE, 1,2-	Not Detected		0.001mg/l
DICHLOROETHANE, 1,1-	Not Detected		0.001mg/l
DICHLOROETHYLENE, TRANS-1,2,	Not Detected		0.001mg/l
DICHLOROETHYLENE, CIS-1,2,	Not Detected		0.001mg/l
DICHLOROPROPANE, 1,2-	Not Detected		0.001mg/l
DICHLOROPROPYLENE, TRANS-1,3,	Not Detected		0.001mg/l
DICHLOROPROPYLENE, CIS-1,3,	Not Detected		0.001mg/l
ETHYLENE DIBROMIDE	Not Detected		0.001mg/l
FLUOROTRICHLOROMETHANE	Not Detected		0.010mg/l
HEXACHLOROETHANE	Not Detected		0.001mg/l
METHYL BROMIDE	Not Detected		0.001mg/l
METHYL CHLORIDE	Not Detected		0.050mg/l
METHYLENE CHLORIDE	Not Detected		0.001mg/l
TETRACHLOROETHANE, 1,1,2,2-	Not Detected		0.001mg/l
TETRACHLOROETHYLENE	Not Detected		0.001mg/l
TOTAL TRIHALOMETHANES	Not Detected	0.10mg/l	0.001mg/l
TRICHLOROETHANE, 1,1,2-	Not Detected		0.001mg/l
TRICHLOROETHANE, 1,1,1-	Not Detected		0.001mg/l
TRICHLOROETHYLENE	Not Detected		0.001mg/l
VINYL CHLORIDE	Not Detected		0.005mg/l
VINYLIDENE CHLORIDE	Not Detected		0.001mg/l
BENZENE	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,4-	Not Detected		0.001mg/l

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CYTO: DE
ANGSC/DEV
ANGSC/SG13

F-31 2/83 By Authority of Act 368 PA 1978 as amended SEP 4 1984 3

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03910 Page:
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:
DMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG.
Street Address: WELL #2
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
DICHLOROBENZENE, 1,3-	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,2-	Not Detected		0.001mg/l
ETHYLBENZENE	Not Detected		0.001mg/l
METHYLETHYL KETONE	Not Detected		0.02mg/l
METHYL ISOBUTYL KETONE	Not Detected		0.020mg/l
STYRENE	Not Detected		0.001mg/l
TOLUENE	Not Detected		0.001mg/l
XYLENE	Not Detected		0.001mg/l

RECEIVED

SEP 4 1984

F-31 2/83 By Authority of Act 368 PA 1978 as amended

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03909 Page: 1
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:
DMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG.
Street Address: WELL #3
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
BROMOETHANE	Not Detected		0.005mg/l
BROMOFORM	Not Detected	0.10mg/l	0.001mg/l
CARBON TETRACHLORIDE	Not Detected		0.001mg/l
CHLOROBENZENE	Not Detected		0.001mg/l
CHLORODIBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
CHLOROETHANE	Not Detected		0.010mg/l
CHLOROFORM	Not Detected	0.10mg/l	0.001mg/l
DICHLOROBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
DICHLOROETHANE, 1,2-	Not Detected		0.001mg/l
DICHLOROETHANE, 1,1-	Not Detected		0.001mg/l
DICHLOROETHYLENE, TRANS-1,2,	Not Detected		0.001mg/l
DICHLOROETHYLENE, CIS-1,2,	Not Detected		0.001mg/l
DICHLOROPROPANE, 1,2-	Not Detected		0.001mg/l
DICHLOROPROPYLENE, TRANS-1,3,	Not Detected		0.001mg/l
DICHLOROPROPYLENE, CIS-1,3,	Not Detected		0.001mg/l
ETHYLENE DIBROMIDE	Not Detected		0.001mg/l
FLUOROTRICHLOROMETHANE	Not Detected		0.010mg/l
HEXACHLOROETHANE	Not Detected		0.001mg/l
METHYL BROMIDE	Not Detected		0.001mg/l
METHYL CHLORIDE	Not Detected		0.050mg/l
METHYLENE CHLORIDE	Not Detected		0.001mg/l
TETRACHLOROETHANE, 1,1,2,2-	Not Detected		0.001mg/l
TETRACHLOROETHYLENE	Not Detected		0.001mg/l
TOTAL TRIHALOMETHANES	Not Detected	0.10mg/l	0.001mg/l
TRICHLOROETHANE, 1,1,2-	Not Detected		0.001mg/l
TRICHLOROETHANE, 1,1,1-	Not Detected		0.001mg/l
TRICHLOROETHYLENE	0.012mg/l		
VINYL CHLORIDE	Not Detected		0.005mg/l
VINYLIDENE CHLORIDE	Not Detected		0.001mg/l
BENZENE	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,4-	Not Detected		0.001mg/l

(CONTINUED)

SEP 4 1984 3

F-31 2/83 By Authority of Act 368 PA 1978 as amended

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03909 Page: 2
PROGRAM CODE: 14

REPORT TO:

Water Supply Division--MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:

DMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG.
Street Address: WELL #3
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
DICHLOROBENZENE, 1,3-	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,2-	Not Detected		0.001mg/l
ETHYLBENZENE	Not Detected		0.001mg/l
METHYLETHYL KETONE	Not Detected		0.02mg/l
METHYL ISOBUTYL KETONE	Not Detected		0.020mg/l
STYRENE	Not Detected		0.001mg/l
TOLUENE	Not Detected		0.001mg/l
XYLENE	Not Detected		0.001mg/l

F-31 2/83 By Authority of Act 368 PA 1978 as amended SEP 4 1984

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03908 Page: 1
PROGRAM CODE: 14

REPORT TO:

Date received: 08/30/84
Date reported: 08/31/84

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Examiner in Charge:

DMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG.
Street Address: WELL #4
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
BROMOETHANE	Not Detected		0.001mg/l
BROMOFORM	Not Detected	0.10mg/l	0.001mg/l
CARBON TETRACHLORIDE	Not Detected		0.001mg/l
CHLOROBENZENE	Not Detected		0.001mg/l
CHLORODIBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
CHLOROETHANE	Not Detected		0.010mg/l
CHLOROFORM	Not Detected	0.10mg/l	0.001mg/l
DICHLOROBROMOMETHANE	Not Detected	0.10mg/l	0.001mg/l
DICHLOROETHANE, 1,2-	Not Detected		0.001mg/l
DICHLOROETHANE, 1,1-	Not Detected		0.001mg/l
DICHLOROETHYLENE, TRANS-1,2,	Not Detected		0.001mg/l
DICHLOROETHYLENE, CIS-1,2,	Not Detected		0.001mg/l
DICHLOROPROPANE, 1,2-	Not Detected		0.001mg/l
DICHLOROPROPYLENE, TRANS-1,3,	Not Detected		0.001mg/l
DICHLOROPROPYLENE, CIS-1,3,	Not Detected		0.001mg/l
ETHYLENE DIBROMIDE	Not Detected		0.001mg/l
FLUOROTRICHLOROMETHANE	Not Detected		0.010mg/l
HEXACHLOROETHANE	Not Detected		0.001mg/l
METHYL BROMIDE	Not Detected		0.001mg/l
METHYL CHLORIDE	Not Detected		0.050mg/l
METHYLENE CHLORIDE	Not Detected		0.001mg/l
TETRACHLOROETHANE, 1,1,2,2-	Not Detected		0.001mg/l
TETRACHLOROETHYLENE	Not Detected		0.001mg/l
TOTAL TRIHALOMETHANES	Not Detected	0.10mg/l	0.001mg/l
TRICHLOROETHANE, 1,1,2-	Not Detected		0.001mg/l
TRICHLOROETHANE, 1,1,1-	Not Detected		0.001mg/l
TRICHLOROETHYLENE	Not Detected		0.001mg/l
VINYL CHLORIDE	Not Detected		0.005mg/l
VINYLIDENE CHLORIDE	Not Detected		0.001mg/l
BENZENE	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,4-	Not Detected		0.001mg/l

(CONTINUED)

 SEP 4 1984 3

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03908 Page: 2
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:

FMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG.
Street Address: WELL #4
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
DICHLOROBENZENE, 1,3-	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,2-	Not Detected		0.001mg/l
ETHYLBENZENE	Not Detected		0.001mg/l
METHYLETHYL KETONE	Not Detected		0.02mg/l
METHYL ISOBUTYL KETONE	Not Detected		0.020mg/l
STYRENE	Not Detected		0.001mg/l
TOLUENE	Not Detected		0.001mg/l
XYLENE	Not Detected		0.001mg/l

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03907 Page: 1
PROGRAM CODE: 14

REPORT TO:

Date received: 08/30/84
Date reported: 08/31/84

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Examiner in Charge:
FMSaad

SAMPLE SOURCE INFORMATION:
System Owner: PHELPS COLLINS ANG
Street Address: BLDG. #7
City or Twp:
County: ALPEN

WSSN:
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
BROMOETHANE	Not Detected		0.001mg/l
BROMOFORM	0.003mg/l	0.10mg/l	
CARBON TETRACHLORIDE	Not Detected		0.001mg/l
CHLOROBENZENE	Not Detected		0.001mg/l
CHLORODIBROMOMETHANE	0.009mg/l	0.10mg/l	
CHLOROETHANE	Not Detected		0.010mg/l
CHLOROFORM	0.002mg/l	0.10mg/l	
DICHLOROBROMOMETHANE	0.004mg/l	0.10mg/l	
DICHLOROETHANE, 1,2-	Not Detected		0.001mg/l
DICHLOROETHANE, 1,1-	Not Detected		0.001mg/l
DICHLOROETHYLENE, TRANS-1,2,	Not Detected		0.001mg/l
DICHLOROETHYLENE, CIS-1,2,	Not Detected		0.001mg/l
DICHLOROPROPANE, 1,2-	Not Detected		0.001mg/l
DICHLOROPROPYLENE, TRANS-1,3,	Not Detected		0.001mg/l
DICHLOROPROPYLENE, CIS-1,3,	Not Detected		0.001mg/l
ETHYLENE DIBROMIDE	Not Detected		0.001mg/l
FLUOROTRICHLOROMETHANE	Not Detected		0.010mg/l
HEXACHLOROETHANE	Not Detected		0.001mg/l
METHYL BROMIDE	Not Detected		0.001mg/l
METHYL CHLORIDE	Not Detected		0.050mg/l
METHYLENE CHLORIDE	Not Detected		0.001mg/l
TETRACHLOROETHANE, 1,1,2,2-	Not Detected		0.001mg/l
TETRACHLOROETHYLENE	Not Detected		0.001mg/l
TOTAL TRIHALOMETHANES	0.018mg/l	0.10mg/l	
TRICHLOROETHANE, 1,1,2-	Not Detected		0.001mg/l
TRICHLOROETHANE, 1,1,1-	Not Detected		0.001mg/l
TRICHLOROETHYLENE	0.010mg/l		
VINYL CHLORIDE	Not Detected		0.005mg/l
VINYLIDENE CHLORIDE	Not Detected		0.001mg/l
BENZENE	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,4-	Not Detected		0.001mg/l

(CONTINUED)

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03907 Page: 2
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:
FMBard

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG
Street Address: BLDG. #7
City or Twp:
County: ALPEN

WSSN:
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
DICHLOROBENZENE, 1,3-	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,2-	Not Detected		0.001mg/l
ETHYLBENZENE	Not Detected		0.001mg/l
METHYLETHYL KETONE	Not Detected		0.02mg/l
METHYL ISOBUTYL KETONE	Not Detected		0.020mg/l
STYRENE	Not Detected		0.001mg/l
TOLUENE	Not Detected		0.001mg/l
XYLENE	Not Detected		0.001mg/l

RECEIVED
SEP 07 1984

F-31 2/83 By Authority of Act 368 PA 1978 as amended SEP 4 1984 3

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03905 Page: 1
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:
FMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG
Street Address: BLDG. #28
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
BROMOETHANE	Not Detected		0.001mg/l
BROMOFORM	0.004mg/l	0.10mg/l	
CARBON TETRACHLORIDE	Not Detected		0.001mg/l
CHLOROBENZENE	Not Detected		0.001mg/l
CHLORODIBROMOMETHANE	0.011mg/l	0.10mg/l	
CHLOROETHANE	Not Detected		0.010mg/l
CHLOROFORM	0.002mg/l	0.10mg/l	
DICHLOROBROMOMETHANE	0.006mg/l	0.10mg/l	
DICHLOROETHANE, 1,2-	Not Detected		0.001mg/l
DICHLOROETHANE, 1,1-	Not Detected		0.001mg/l
DICHLOROETHYLENE, TRANS-1,2,	Not Detected		0.001mg/l
DICHLOROETHYLENE, CIS-1,2,	Not Detected		0.001mg/l
DICHLOROPROPANE, 1,2-	Not Detected		0.001mg/l
DICHLOROPROPYLENE, TRANS-1,3,	Not Detected		0.001mg/l
DICHLOROPROPYLENE, CIS-1,3,	Not Detected		0.001mg/l
ETHYLENE DIBROMIDE	Not Detected		0.001mg/l
FLUOROTRICHLOROMETHANE	Not Detected		0.010mg/l
HEXACHLOROETHANE	Not Detected		0.001mg/l
METHYL BROMIDE	Not Detected		0.001mg/l
METHYL CHLORIDE	Not Detected		0.050mg/l
METHYLENE CHLORIDE	Not Detected		0.001mg/l
TETRACHLOROETHANE, 1,1,2,2-	Not Detected		0.001mg/l
TETRACHLOROETHYLENE	Not Detected		0.001mg/l
TOTAL TRIHALOMETHANES	0.023mg/l	0.10mg/l	
TRICHLOROETHANE, 1,1,2-	Not Detected		0.001mg/l
TRICHLOROETHANE, 1,1,1-	Not Detected		0.001mg/l
TRICHLOROETHYLENE	0.011mg/l		
VINYL CHLORIDE	Not Detected		0.005mg/l
VINYLIDENE CHLORIDE	Not Detected		0.001mg/l
BENZENE	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,4-	Not Detected		0.001mg/l

(CONTINUED)

[illegible]EMICAL ANALYSIS OF [illegible]ATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03905 Page: 2
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:

FMSaad

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG
Street Address: BLDG. #28
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
DICHLOROBENZENE, 1,3-	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,2-	Not Detected		0.001mg/l
ETHYLBENZENE	Not Detected		0.001mg/l
METHYLETHYL KETONE	Not Detected		0.02mg/l
METHYL ISOBUTYL KETONE	Not Detected		0.020mg/l
STYRENE	Not Detected		0.001mg/l
TOLUENE	Not Detected		0.001mg/l
XYLENE	Not Detected		0.001mg/l

RECEIVED
SEP 5 1984

F-31 2/83 By Authority of Act 368 PA 1978 as amended SEP 4 1984 3

[illegible]EMICAL ANALYSIS OF [illegible]ATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO.: 8408-03906 Page: 1
PROGRAM CODE: 14

REPORT TO:

Date received: 08/30/84
Date reported: 08/31/84

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Examiner in Charge:

[signature]

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG
Street Address: BLDG. 333
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
BROMOETHANE	Not Detected		0.001mg/l
BROMOFORM	0.004mg/l	0.10mg/l	
CARBON TETRACHLORIDE	Not Detected		0.001mg/l
CHLOROBENZENE	Not Detected		0.001mg/l
CHLORODIBROMOMETHANE	0.012mg/l	0.10mg/l	
CHLOROETHANE	Not Detected		0.010mg/l
CHLOROFORM	0.003mg/l	0.10mg/l	
DICHLOROBROMOMETHANE	0.007mg/l	0.10mg/l	
DICHLOROETHANE, 1,2-	Not Detected		0.001mg/l
DICHLOROETHANE, 1,1-	Not Detected		0.001mg/l
DICHLOROETHYLENE, TRANS-1,2,	Not Detected		0.001mg/l
DICHLOROETHYLENE, CIS-1,2,	Not Detected		0.001mg/l
DICHLOROPROPANE, 1,2-	Not Detected		0.001mg/l
DICHLOROPROPYLENE, TRANS-1,3,	Not Detected		0.001mg/l
DICHLOROPROPYLENE, CIS-1,3,	Not Detected		0.001mg/l
ETHYLENE DIBROMIDE	Not Detected		0.001mg/l
FLUOROTRICHLOROMETHANE	Not Detected		0.010mg/l
HEXACHLOROETHANE	Not Detected		0.001mg/l
METHYL BROMIDE	Not Detected		0.001mg/l
METHYL CHLORIDE	Not Detected		0.050mg/l
METHYLENE CHLORIDE	Not Detected		0.001mg/l
TETRACHLOROETHANE, 1,1,2,2-	Not Detected		0.001mg/l
TETRACHLOROETHYLENE	Not Detected		0.001mg/l
TOTAL TRIHALOMETHANES	0.026mg/l	0.10mg/l	
TRICHLOROETHANE, 1,1,2-	Not Detected		0.001mg/l
TRICHLOROETHANE, 1,1,1-	Not Detected		0.001mg/l
TRICHLOROETHYLENE	0.011mg/l		
VINYL CHLORIDE	Not Detected		0.005mg/l
VINYLIDENE CHLORIDE	Not Detected		0.001mg/l
BENZENE	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,4-	Not Detected		0.001mg/l

(CONTINUED)

F-31 2/83 By Authority of Act 368 PA 1978 as amended SEP 4 1984 3

CHEMICAL ANALYSIS OF WATER

Laboratory and Epidemiological Services Administration
Michigan Department of Public Health
3500 North Logan, P.O. Box 30035
Lansing, MI 48909
Telephone (517) 373-1428

Abbreviations: GT = Greater than given value
MCL = State regulated maximum contaminant limit

LAB NO : 8408-03906 Page 2
PROGRAM CODE: 14

REPORT TO:

Water Supply Division-MDPH
3500 N Logan, Box 30035
Lansing, MI 48909

Date received: 08/30/84
Date reported: 08/31/84

Examiner in Charge:

DMRead

SAMPLE SOURCE INFORMATION:

System Owner: PHELPS COLLINS ANG
Street Address: BLDG. 333
City or Twp:
County: ALPEN

WSSN: 2011604
Location/Source:
Collected by: OVERMYER
Date Collected: 08/29/84

Test Name	Test Result	Standard Health MCL	Detection Test Limit
DICHLOROBENZENE, 1,3-	Not Detected		0.001mg/l
DICHLOROBENZENE, 1,2-	Not Detected		0.001mg/l
ETHYLBENZENE	Not Detected		0.001mg/l
METHYLETHYL KETONE	Not Detected		0.02mg/l
METHYL ISOBUTYL KETONE	Not Detected		0.020mg/l
STYRENE	Not Detected		0.001mg/l
TOLUENE	Not Detected		0.001mg/l
XYLENE	Not Detected		0.001mg/l

RECEIVED
SEP 07 1984

F-31 2/83 By Authority of Act 368 PA 1978 as amended SEP 4 1984 3

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE 5 OCT 1984

FROM: USAF OEHL/SA
BROOKS AFB TX 78235

SAMPLE IDENTITY
WATER

DATE RECEIVED 11 Sept 84

S PLE FROM
PHELPS-COLLINS

LAB CONTROL NR 50853,55,58

TEST FOR
olatile Halocarbons

Methodology: EPA Method 601

	WELL #4	BLDG 28	WELL #5			
OEHL NO:	50853	50855	50858			DET.
ASE NO:	6P840064	6P840062	6P840063			LIMIT
romodichloromethane	ND	13.0	ND			0.1
Bromoform		7.8				0.2
romomethane		ND				1.0
arbon Tetrachloride						0.1
Chlorobenzene						0.2
loroethane						0.5
-Chloroethylvinyl ether						0.1
Chloroform	0.3	6.5				0.1
hloromethane	ND	ND				0.1
ibromochloromethane		18.4				0.1
1,2-Dichlorobenzene		ND				0.2
,3-Dichlorobenzene						0.2
,4-Dichlorobenzene						0.2
ichlorodifluoromethane						0.1
1,1-Dichloroethane						0.2
,2-Dichloroethane						0.2
,1-Dichloroethene						0.1
trans-1,2-Dichloroethene						0.1
,2-Dichloropropane						0.1
is-1,3-Dichloropropene						0.2
trans-1,3-Dichloropropene						0.2
Methylene Chloride						0.2
,1,2,2-Tetrachloroethane						0.1
Tetrachloroethylene	0.5		TR			0.1
1,1,1-Trichloroethane	ND		ND			0.1
,1,2-Trichloroethane						0.1
richloroethylene		8.7				0.1
Trichlorofluoromethane		ND				0.1
inyl Chloride		ND				0.2

Results in Micrograms per Liter

Edward J. [illegible] 11 OCT 1984
Maj, USAF

EQUESTING AGENCY (Mailing Address)
ANGSC/SGB
ANDREWS AFB, MD
20331-5000

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

A L Willis
Technician